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The Farmer's Digest

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The Farmer's Digest

Volume 14 February, 1951 Number 10

Cutting Cost of Making Milk

Condensed from New Jersey Farm and Garden

Dr. William H. Martin

New Jersey Experiment Station, Rutgers University

Five years ago the N. J. Experiment Station set up an experiment to study the benefits of feeding high quality roughages to dairy cows. We wanted to find out how much grain had to be fed with real high quality hay, silage, and pasture in order to produce milk most profitably.

Grants to carry on this study were provided by the Grange League Federation and the Dairymen's League Cooperative.

When we added up the results of this study we thought they were spectacular enough to call together some 30 representatives of farm magazines, radio stations, newspapers, and dairy organizations who met with us two weeks ago to talk over the figures.

Here's what we found:

If all New Jersey dairy farmers grew and fed high quality roughage (such as U. S. No. 1 extra green leafy second or third cutting alfalfa hay and corn silage during the barn feeding periods, and a good grass-legume pasture during the summer), they could maintain present milk production without feeding a pound of grain!

With the price of grain where it is and the price of milk at present levels, dairymen who have good roughage could make the most net profit by cutting their grain feeding down to one pound for each six pounds of 4% milk produced. Most dairymen are feeding twice this much.

In New Jersey there are 158,000 dairy cows which have an average production of 7,210 pounds of milk per year. Averaging the state as a whole, these cows get grain at the rate of one pound to each three pounds of milk produced. That's a little over a ton per cow per year. The reason we have to feed so much grain to get this amount of milk is not hard

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to find. It's because our cows don't get enough high quality hay, pasture, and silage to keep up the milk flow.

If our farmers, as a group, would do the things necessary to produce top quality hay and succulent grass-legume pasture that stays green and plentiful through the hot summer months, they could eliminate the feeding of some 79,000 tons of grain concentrates per year. At an average price per ton of $75, this would represent a saving of nearly $6,000,000 per year in New Jersey alone.

This is no idle dream. Our five years of study at New Brunswick prove it can be done. And many of our leading dairy farmers who have developed the kind of roughage programs we are talking about are doing it.

In most years we need to feed some grain to get the highest possible net return. The amount of grain we can feed profitably depends on the relationship between (1) the cost of grain concentrates, (2) the price we get for milk, and (3) the cost of growing and harvesting high quality hay, pasture, and silage.

The cost of producing roughage is more or less constant. It doesn't fluctuate as much or as fast as the other two items. Our Department of Agricultural Economics estimates that in 1949 it cost our farmers about $28 to produce a ton of alfalfa hay, $8.90 for a ton of corn silage, and $1.45 for 100 pounds of total digestible nutrients in pasture.

With roughage costs at about this level, the main things we have to watch are the price of milk and the price of grain. If the price of grain is high ($75 per ton or over) and the price of milk drops to $3.90 per hundredweight or lower, our cows will make us the best return if we cut out the grain altogether and give them all the high quality roughage they can eat.

On the other hand, if the price of grain should slide down to $40 per ton or lower (which certainly isn't in the picture at present) and if the price of milk stays over $3.50 per hunderdweight, heavy grain feeding (1 to 3) and high quality roughage will be most profitable.

Under most other conditions we'll do best by keeping our grain down to a 1:6 ratio, combined with quality roughage.

Don't forget that term—"quality roughage." The most important thing we found in our five-year study was that liberal quantities of high quality roughages must be supplied to dairy cows throughout the year. When they get the kind of roughage we're talking about, your cows will surprise you with the amount they'll stow away.

During the experiment, one

group of cows that got nothing but roughage ate an average of 2.29 pounds of hay and 2.79 pounds of silage per 100 pounds of body weight. This is equivalent to a 1,000-pound cow eating 22.9 pounds of hay and 27.9 pounds of silage per day!

Another group that got grain at the ratio of 1 to 6 ate 2.05 pounds of hay and 2.69 pounds of silage per 100 pounds of body weight, and the third group, which got grain at a 1 to 3 ratio, ate 1.75 pounds of hay and 2.51 pounds of silage per 100 pounds of body weight.

The first group produced 8,410 pounds of 4% milk, the second group, 9,741.4 pounds and the third 10,313 pounds. These were all on twice-a-day milking over a 305-day lactation period. As I stated before, the highest return over feed cost was achieved by the middle group. Holstein, Jersey, Brown Swiss, and Ayshire cows were used in this experiment.

There's food for thought here for every dairyman. Facing continued high labor and feed costs, competition, we've got to devote more attention to our roughage programs if we're going to keep dairy farming in a healthy solvent condition.

More Profitable Beef!

Condensed from The Dakota Farmer

From a practical standpoint, the ability to produce fast-gaining offspring is more important than the transmission of type or conformation. Experimental work indicates that the fast-gaining characteristic is inherited just as truly as the other two. Unfortunately, they are not transmitted together.

Studies at the Bozeman and Miles City stations in Montana are particularly interesting to ranchers. Results have repeatedly shown that a close relationship exists between rate and efficiency of gain after weaning. In short, the fastest gainers do it at the lowest feed costs. Not only that, but they do it either in the feed lots or on pasture.

Figures, on nearly 400 calves from 50 different bulls, show that the fast-gaining trait is inherited in about 80% of the cases. The weight to be expected at 15 months of age is believed about 76% dependent on ancestry. This rate-of-gain business varies a lot more than would be expected.

This was especially well illustrated by an experiment on some

Reprinted by permission from The Dakota Farmer, Aberdeen, South Dakota, September 3, 1949

steer calves sired by five different bulls. Calves from the best bull averaged $36 per head more profit than did those from the poorest one! Yet all five bulls looked about the same!

W. H. Black of the U. S. Department of Agriculture reported another thought-provoking experiment. The steers sired by one bull reached a 900-pound weight more than three months earlier than those from another bull when all animals were handled under identical conditions. In addition to making cheaper gains, the faster-growing steers reached market well ahead of the heavy fall rush of cattle from the range area, and so were sold for a much better price. With the above being true, it can be seen that the right kind of a herd sire has a lot to do with the profitable production of beef.

It follows, then, that the cows in a beef herd are also important in regard to insuring fast-gaining calves. Heredity is a double-barrelled sort of thing, you know, and is contributed to by both sides of a family tree. Therefore, both bulls and cows of the right kind are needed for a crop of mortgage-busting calves.

Few ranchers will dispute the logic of more money from faster-gaining calves from better breeding stock. However, many of them will point out that they are not operating under experiment station conditions.

"My cattle are on the range," they are apt to object. "What can I do about selecting faster-gaining animals for my breeding herds?"

Maybe more than you'd think! This is because the bulls and cows themselves are pretty good indicators of what their calves will do in the feed lot. Let's consider the bull first.

Work at Montana since 1940 has compared the feed lot performance of about 70 bulls and 700 of their offspring. Particular attention has been paid to respective abilities for making fast and efficient gains. Today it can be stated with reasonable accuracy that a sire's offspring will do just about what he did as a calf in the feed lot. How is such knowledge apt to benefit an ordinary rancher? Well, it furnishes proof that proven or indexed bulls may not be out of his reach, after all. He has a choice of two courses for getting them.

First of all, he may use sires that have been tested in the feed lot as calves by someone else. Such animals may be purchased from another breeder, as they frequently are. However, they may even be out of his own herd. In this latter case, they have been "farmed out" for proving. An example of this sort of work is furnished by the Bozeman station, where testing has been done for purebred breeders during the past three years. Bulls

that fail to measure up are then withheld from service.

The other course consists of the rancher proving the bulls for himself. All he needs is a set of scales to weigh the calves into pastures or feed lots and out again after a six-months feeding trial. Animals under testing conditions should be within six or eight weeks of the same age. If desired, they can be grouped according to sires, and individual feed records kept. However, such extras are not necessary and will be impractical for the average rancher, anyway.

When bulls are purchased, and the indexed variety is unavailable, it will probably pay the new owner to do his own indexing work. In such an event, it is recommended that he purchase about one-fourth more bull calves than he actually needs. At the conclusion of the feeding test, the poorer 25% can be discarded and enough bulls will still remain for the breeding herd.

These are the two ways in which an owner can go about providing better bulls for his beef herd. The proving doesn't take too much time or money in either case, and will help considerably in taking the guesswork out of sire selection.

However, we still have to consider the cows in such a herd. As we have noted earlier, they are halfway responsible for what the calves inherit, too. In regard to the females, an efficient and practical plan of selection is followed at the New Mexico Agricultural station. It is concerned with the performance of first-calf heifers, and we think it a good one.

Thirteen years of experience with a 150-cow herd has convinced the New Mexico workers that the weight and gain of that first calf is a pretty good indication of what can be expected from the dam in future years. They claim that a three-year-old that raises an underweight, poor-grade calf will probably keep right on doing it year after year. Contrawise, those that produce big, fast-growing youngsters can be expected to keep up the good work. The records show they have made only two mistakes in 100 heifers evaluated in this manner.

This method of selection works on older animals, too. However, the calves from heifers are generally smaller than those from cows. Consequently first calves should be compared only with first calves, and those from older animals with others of the same kind. Otherwise, inaccuracies may creep in regarding the capabilities of the dams.

Thus we believe that the selection of better females can easily be combined with the use of indexed sires to produce more profitable beef. Time spent to insure fast-gaining calves can pay off pretty good wages for you.

Big Business on the Plains

Condensed from The Cattleman

Joe Heflin Smith

FROM 1873 to 1883, the slaughter of the American bison on the Great Plains was one of the most dazzling financial "intakes" ever seen in the U. S. A.

Competent authorities conservatively estimate that a net profit of over twenty million dollars was ripped from the carcasses of the lumbering ugly beasts during the decade; then his bones brought in a handsome purse. Railway and steamship companies raced for the buffalo business, and men left solid jobs on the East Coast to take a fling at the quick money on the buffalo Plains.

The buffalo hardly knew what hit him until he was only a memory. The deadly aim of rough riding buffalo hunters was all it took to erase him forever from the wide open spaces that he had dominated so long. In ten years, a few bleached and scattered bones were all that was left of an animal that was as much a part of the wide treeless region as the north winds that whistle and howl over it from Canada to the Gulf.

Aside from being big money, it was probably the easiest ever taken from a stubborn country that yields profits slowly and then only to the most resourceful.

The cattleman, who came on the Plains as the last sounds were dying from the hunters' Long Toms, never had it as easy as the "buffalo business." He had to worry about calf crops, water, thieves, and falling prices. But the overhead expenses of the hide companies were little. Hunters with only a little salt, a rifle, a light camping outfit, and a rugged constitution went on the Plains and slaughtered for a small commission per hide or sold outright to hide companies.

The buffalo was there. No person had brought him to slaughtering age by long hard days in the saddle. No person had managed for his range and watched over him until shipping time.

The killing was sure and fast. It was so fast, in fact, that big fur companies such as W. C. Lobenstein and Company of Leavenworth, Kansas, sent their big wagons, fully equipped for hauling hides, straight to the Plains. Their drivers loaded and paid off on the spot. There was no delay. A smooth working hide gang

Reprinted by permission from The Cattleman,
Fort Worth, Texas, November 1950

could kill and skin from one hundred to three hundred buffaloes in a day. That amount multiplied by several thousand crews adds to a gigantic pile of hides. One traveler through Northern Kansas in the middle 70's saw hundreds of ricks of bison hides stacked alongside the railroad. Each rick was as large as a two-roomed shack. Over 250,000 hides were auctioned off in a single day in Fort Worth, Texas, in the early 70's.

A good hide crew was well organized. It usually consisted of from five to seven men. There was a "killer" or two, three or four skinners, and a camp roustabout who also served as cook and pegger. The "killers" would go slightly in advance and "lay-'em" out, and wave a signal to the skinners who were standing ready. The skinners would go immediately and rip the hides from the carcasses before they were hardly still. The hides were removed to a central spot where they were pegged down and allowed to dry. They were usually creased for shipping. A well equipped hide crew had several good straight knives for ripping down the bellies and slitting the legs; they had as many curved knives for the actual skinning, and a good grind rock. Like any other business, the better the equipment, the better the pay. If the killer's gun became too hot to handle and he was in a large herd, it was placed on a three-legged stand and the firing went on. Hunters soon learned to apply tricks to their trade. They would pick out the largest herd and drop the lead buffalo. Out of curiosity, others would mill around their fallen comrade, giving hunters many shots while his target was almost still.

Hide gangs roamed at will. Their addresses were "unknown." Where the buffalo roamed, the hunter was only a wagon's length behind. Night found the crew in a compact camp eating juicy buffalo steaks and drinking whatever they had. Next morning, the work went on as usual.

It was no trick for a good hide gang to get from two thousand to four thousand hides per season. Prices for good hides usually ran from $1.50 to $2.50 each. Simple arithmetic proves that a group of working men could throw in together and make more money on the Plains chasing buffaloes than in any other spot in the United States. It's no wonder that men left all sorts of work in the East to brave the dangers of bison hunting. And there were many dangers.

Treacherous Plains Indians, mounted on fast ponies, resented the white man killing their never-failing source of meat and shelter, and did all they could to prevent it. Indians knew the fate of many hunters who went to the Plains

and were never heard of again. Once, near where Liberal, Kansas, is today, a hide gang was at work. Two killers were in the field and had slain about thirty buffalo before the herd moved on. The skinners were going to the dead animals when a band of Comanches dashed up and murdered the entire crew of six. Their scalps were taken, their equipment plundered, and their horses added to the remuda of the redskins. Another crew came up a few hours later to view the ghastly mess.

The Indian utilized the buffalo in many different ways. Walter Prescott Webb in his fine book, The Great Plains, says, "The buffalo had more influence on man than all other Plains animals. It was food, life, raiment, and shelter for the Indian."

Besides enjoying the rich juicy meat, the Indian used the bones to make various tools and implements. And the hides were made into coverings, water bags, moccasins, and quivers.

Side line businesses followed the hide companies and did a "land office" trade. Merchants in dugouts and improvised hide huts netted as many as two thousand dollars a day from sales of rifle balls, whiskey, tobacco, and crude clothing. Frequently, in the absence of money, hides were given in exchange for purchases. In some instances, storekeepers hunted during the day and "opened-up" when the hunters starting drifting in at night.

The robe and hide business was far reaching. Many hides sold to W. C. Lobenstein and Company went to England. The British army equipped many troops with uniforms made of buffalo skin because it was more durable and pliable under all weather conditions.

There were several types of robes. The "beaver" was a rich brown with exceedingly fine fur. It was rare because, it is said, only one in a thousand was found. The black robe was more common and many were shipped from the buffalo country. The most common of all was the buck skin or dark yellow. A white robe was rare indeed and brought a fancy price.

Although many people will vouch that no meat excels it in flavor, little buffalo meat was used during the big kill. Railroad construction crews and hunters thrived on it, but, for the most part, the meat was wasted. The tongues were considered a delicacy and brought high prices on eastern menus. They weighed only a few pounds and were slashed from the mouths of the dead animals as nineteen hundred pounds of juicy meat rotted on the Plains or was eaten by the coyotes and buzzards.

Big hide companies were not the only ones who benefited from the buffalo. Many an early settler, who found it hard to wrestle a

living from the stubborn soil, made it through long hard winters by picking up and selling the remnants of bones skipped over by the large companies. It is estimated that the Santa Fe Railroad Company transported 1,500,000 tons of bones in three years at $8.00 per ton. In ten years, over two million dollars were paid out for bones in Kansas alone. Other Plains states witnessed the same prosperity.

Fuel has always been a problem on the High Plains. Pioneers found little to keep them from freezing save the buffalo chips that dotted the landscape in great numbers. After the chip had dried it made excellent fuel and kept many homes warm as raging winds circled in from the north and left the country frozen and still.

Roughly, "buffalo land" was that lonely area stretching from the upper reaches of Saskatchewan and Manitoba to Mexico and from the Mississippi river to the Pecos. Many people think that the buffalo never roamed far from this section because grasses in other parts of the country did not contain sufficient calcium for his bone structure.

At any rate, the big surly fellow was in the short grass region when the first Spanish explorers pushed up from Mexico in the fourteenth century. Writers in Coronado's expedition across the region in 1542 noted them in journals. They described them as being huge with humps on their backs and with meat juicy and flavorsome. At that time, buffaloes were as thick, almost, as the tough nutritious grass they ate and thrived on, later named Buffalo Grass.

The world-known naturalist, Ernest Thompson Seton, calculated that near 75,000,000 buffaloes roamed the Plains during primitive times. It is further believed that after the Indian became mounted he depreciated the herd at the rate of three million per year. Fires, blizzards, and wild animals probably destroyed another million annually.

Other observers are more liberal in their estimates as to the number of buffaloes that walked the Plains prior to 1850. The noted plainsman, Richard I. Dodge, described one herd along the Arkansas river that covered an area fifty miles square or, approximately, one million buffaloes. Other pioneers say that some single herds totaled as many as ten million.

One old timer had this to say about the size of a herd he saw in the early 70's near where Sharon Springs, Kansas, is today: "It was just after sun-up and I was on top of a small hill. I looked toward the north and saw the herd coming. It must have been eight or ten miles wide and the country was black with 'em as far as I could see. Every knoll was covered

with buffaloes. There was every type in that herd—old cows, old bulls, young calves, and yearlins'. I believe a man could have walked from the back of one to the back of another for days and never touched the ground. I wish I knew how many buffaloes were in that herd."

Another frontiersman described a herd on stampede in the Oklahoma Strip. The herd crossed a narrow ravine and several fell in. Others kept coming at full speed and fell on top of the others and were trampled by on-coming buffaloes until a bridge was formed over which the others sped on their way.

The coming of transcontinental railroads supplied the knock-out blow to the buffalo who was staggering and sick from the repeated blows of the hide hunter. Professional killers were hired by railroads to clear the rights-of-way and leave vacant strips for the oncoming rails. More important, however, was the need of meat for construction crews. The hunters supplied it in abundance.

It was at this stage of western history that "Buffalo Bill" Cody made his appearance and continued to be a national hero to both old and young until his death. The Kansas Pacific Railroad Company hired the sharpshooter at the fancy salary of $500 per month to shoot buffalo and he was worth every cent of it. In about a year and a half, he killed almost 4500 buffaloes. Once, as a sporting gesture, he killed sixty in one day.

People who rode the trains did their part toward eliminating the bison. Trains would stop and, as large herds passed in front and behind them, passengers would rest rifles on coach window sills and shoot 'till their hearts content.

Railroads advertised buffalo hunting expeditions and arranged schedules for the convenience of their guests. The hunts became the prime sport of distinguished gentlemen from all parts of the world.

One of the big events of that day was the hunt arranged for the Grand Duke Alexis of Russia. The event took place in 1872 and was planned by General Sheridan and General George C. Custer with "Buffalo Bill" Cody as chief guide and hunter. Experienced cooks, roustabouts, and waiters were brought from the east. Tents were heated and the Grand Duke walked on ground coverings within his mobile home. Choice wines from abroad were served with juicy buffalo steaks, and smoke from imported tobaccos drifted toward the sky while the exclusive party conversed in camp as day faded into twilight. Members of this party slaughtered near twelve hundred in two days of leisure shooting with an occasional burst of speed to thrill the Duke.

On other occasions, sportsmen from Europe would dock in San Francisco and hire professional guides and cooks. The party would take a leisurely trip across the Plains, shooting as it went. After killing all the game desired, the trip would end in New York or Boston.

But the buffalo did not make his last stand lying down. He gave his conquerors plenty of trouble. And he was large enough to do so. A full grown, well developed bull stands near six feet at his highest point. He is between nine and thirteen feet long including the length of his tail. He weighs around nineteen hundred pounds, but some have weighed as many as 2450 pounds. His horns are short, but the space between them is hard as steel. And he knows how to use those horns. He can rip a horse from end to end with one savage swish of his head. He charged his enemies and gored them to death. He ruined water holes. He trampled down camps and demolished precious equipment. Observers say that a mother buffalo guarding her calf is the most savage creature that ever trod the tough sod of North America.

New telegraph lines followed the railroads. The tall, even poles stretched forever away across the prairies—straight through the heart of "buffalo land," and were promptly surrounded by buffaloes. They butted down many poles or rubbed them to a leaning position as they slowly eased the irritation of their rough hides by "scratching." When pole companies drove sharp heavy spikes up the poles a few feet to keep them from being rubbed, Mr. Buffalo found them exactly to his liking and more convenient than smooth poles. He could scratch with less effort, and it was more soothing to his skin.

Once in a while, big surly bulls charged into moving trains and damaged cars or completely uncoupled them. Many times trains were forced to stop for several hours while herds crossed the tracks.

It is agreed that the buffalo is a strange creature with varying moods and temperaments. At times he is as docile as a kitten, and trembles at the movement of a leaf. The next moment he may roar into a fury and destroy everything in sight. He is a good engineer, and pointer to water. In pioneer days, wagon train scouts quickly learned that buffalo trails finally led to water. Railroad engineers noted that his trails followed the lines of least resistance.

By the turn of the century, the buffalo had faded into oblivion. There was little left to remind people of the Mighty Monarch of the Plains. Now and then a skull was found in an out-of-the-way place, and pioneer children found a few bones as they romped and

played over his former domain. Covered wagons jolted over trails cut deep through the ages by his sharp hoofs as he plodded from north to south and back again.

The buffalo had to go. Farmers and ranchers needed the land. Officials encouraged the extinction of him because they said, "When the buffalo is gone, the Indian will be easier to handle."

However, several Congressmen and a few interested individuals started a movement to conserve the buffalo. President Cleveland signed a bill making it a fine to shoot buffalo in Yellowstone National Park. The Park managers restocked from the few scattered herds in various parts of the country.

In 1905, President Theodore Roosevelt became interested and helped to organize the American Bison Society. Several thousand dollars were raised to help breed and maintain the buffalo herds in Government supervised areas.

Today it is estimated that around ten thousand buffaloes are in the United States, and approximately fifty thousand in the North American continent.

Diligent care will enable existing herds to increase, but the bison will never again be a part of the west. He gave a good account of himself while he lasted and business men accounted for his existence in large profits made easily and quickly.

Research Gives the Answers

Condensed from Everybodys Poultry Magazine

C. E. Lee

THERE have been a great many recommendations made as to the feeding space required per 100 layers but so far as we know none of these has been based on exhaustive scientific experiments. Many highly scientific subjects such as "the flagellated protozoa of the intestinal tract" have been investigated in great detail by aspiring graduate students but it appears that the very important practical question of how much hopper space a hen needs has received practically no attention.

More than six years ago we began a series of experiments designed to answer this practical question. We now have nearly six years of data covering several different breeds and crosses. However, it should be noted that only one type of feeding program has been used in all these experiments,

Reprinted by permission from Everybodys Poultry Magazine, Hanover, Pennsylvania, December 1950

a 22 percent protein laying mash kept before the birds in hoppers at all times, a supplementary feeding of pellets at noon, and a light feeding of grain in the morning and the greater part of the grain ration at evening. Normally, about one-quarter of the total grain ration is given at the morning feeding and this is given in the litter. The evening feeding is spread on top of the mash in the hoppers but some spills over into the litter providing additional incentive for exercise and stirring the litter.

The accompanying table, giving 8½ months of the current series, is typical of the results during all of the six years. In this case the breed was New Hampshire but we find relatively little difference in the actual space requirements between Leghorns and the heavier breeds, including New Hampshires, Rhode Island Reds and Barred Rock-New Hampshire crosses.

In general, four different levels of feeding space allotment have been studied, 24, 32, 40, and 48 feet per hundred birds. This is actual linear feeding space. In other words an eight-foot hopper gives 16 feet of actual feeding space.

In 1950 we have investigated only the differences in production between the 24 and the 48-foot levels in order to have more pens on each level and thus make a better experiment.

The table shown herewith indicates that in 8½ months there was a difference of almost a dozen eggs per bird between the average performance of the birds on the 48-foot level and those on the 24-foot level.

The allotment of feeding space was kept absolutely constant in all pens. When a bird died the

A Study of Hopper Space Requirements

Length of Test—260 days No. of Birds Per Pen—175

Pen No.	Feeding Space per 100 birds	Feed Consumption Mash	Pellets	Grain	Total Feed Consumed	Lbs. of Feed per doz. eggs	% Production	% Mortality
1	48	43.08	17.97	27.10	88.15	6.00	68.97	18.29
3	48	43.96	18.30	27.32	89.58	5.86	71.55	15.43
5	48	45.54	19.33	27.07	91.94	5.70	75.12	19.43
Averages		44.19	18.53	27.17	89.89	5.85	71.88	17.72
2	24	41.18	17.82	26.86	85.86	5.96	67.72	17.14
4	24	40.84	17.95	26.82	85.61	6.04	67.03	14.29
Averages		41.01	17.88	26.84	85.73	6.00	67.37	15.71

Average number of eggs per bird in pens with 48 feet of hopper space .. 185.82 eggs
Average number of eggs per bird in pens with 24 feet of hopper space .. 174.02 eggs
Difference in production (per bird) for the 8½ months ..... 11.80 eggs

amount of space was correspondingly reduced by moving a wooden partition in one of the mash hoppers the proper distance and filling in back of it with shell and grit.

It will be noted that while the mash consumption was slightly higher with the birds having the 48-foot allotment the actual feed efficiency was better, due to the increased production. Whether the matter of time of feed consumption had anything to do with this we do not know but it is logical to assume that when birds get down from the roost in the morning and have to wait in line for feed they are very likely to consume litter instead of good mash, and later, when there is finally space available at the mash hoppers, they may not eat the required amount. The same thing may happen at evening although there was no really significant difference in the consumption of scratch grains, the greater part of which is given at the evening feeding.

It is very obvious that there is nothing the poultryman could do to increase egg production to a corresponding extent, that would be much easier or simpler than to simply increase mash hopper space, if he does not have the required amount.

Previous investigations have revealed that the difference in production between birds on the 24-foot and the 32-foot level is considerably less than between those on 24 and 48 foot, and likewise between the 32-foot and 40-foot allotment but it seems that the 32-foot level is about the minimum at which something approaching the best level of production of which the birds are capable can be obtained. The results on the 32-foot level have indicated that birds with this allotment cannot be expected to equal those having 40 or 48 feet of hopper space but they do show a very decided gain above the 24-foot level; more difference in fact than between any other two levels.

In recent years a great many poultrymen have installed fluorescent lamps in their poultry houses in place of the ordinary filament lamps. It may be that in some cases light meters have been used to measure the intensity of illumination. Probably few of the light meters that have been so used are properly designed to measure light as the hen sees it. The poultryman usually determines the amount of illumination by his own visual impression. The fact of the matter is that light as the average human eye sees it is no indication at all of what the response of the same light would be from the chicken. The chicken's eye is principally sensitive to the red end of the spectrum and is totally blind in the blue portion of the spectrum. A 20-watt fluorescent lamp gives approximately twice as much

light as a 40-watt filament lamp but only half as much light in the red end of the spectrum to which the chicken is most sensitive. The 40-watt fluorescent lamp gives almost five times as much light as the 40-watt filament lamp but has just about the same amount of red light to which the chicken is sensitive.

Work done at Pennsylvania State College many years ago on fluorescent lamps and their effect on poultry brought out this point, which appears to have been forgotten by the poultry industry generally nowadays.

Investigators at Pennsylvania State College found that high foot candles in the early fluorescent lamps did not produce any more effect than did the low levels of light obtained from the incandescent filament lamp. Some of the newer fluorescent lamps are now designed to give much more light in the red end of the spectrum and they would be more satisfactory for this type of application in a poultry house.

Engineers at the famous General Electric Nela Park in Cleveland have also investigated the sensitivity of poultry and people to various types of lights and call attention to the fact that where fluorescent lamps are to be used, special meters should be utilized to test the amount of illumination produced. Even so the meters will not measure light as it will be utilized by the hen because the human eye is most sensitive to the light in the middle of the spectrum in the yellow-green range rather than to either the red or the blue.

From a practical standpoint, therefore, it might be worth while for the poultryman to run a few short tests before changing over from filament lamps to fluorescent so as to be certain that he is installing enough of the fluorescent lamps to give the hens the necessary amount of light that they need. Production records should be kept on several different pens of the same age and type and which have previously shown reasonably close comparisons. Probably two or three months at least should be allowed for any differences caused by illumination.

In buying fluorescent lamps it would be well to specify the deluxe type with more light in the red end of the spectrum than the earlier types of fluorescent fixtures.

Experience in the field, particularly in some of the intensive broiler areas, indicates that mycosis is more serious and widespread at present than ever before. Unfortunately, in many cases, pathologists seem to disregard the presence of mycosis.

Because of the wide variation in symptoms, mycosis is not always easy to diagnose and may frequently be mistaken for some other trouble. While the most common lesion is the production

of grayish false membranes in the crop and, after the infection becomes established, whitish ulcer-like areas in the digestive organs, varying in size from a pin point to half an inch or a longer ridge formation, there are many cases where other symptoms may appear instead. Examination of the throat may show white canker-like patches and a thick white mucus-like discharge in the trachea. Lungs may show a pneumonia-like condition in which they become very red and hard but do not develop the black patched or general discoloration which accompanies ordinary pneumonia. Because of this involvement of the respiratory system the disease may also be confused with laryngotracheitis or pneumonia.

Where the erosive action is found it may be present in the crop, the proventriculus, and in the gizzard and intestines. In some cases the gall bladder and vent will be affected and there will be a development of a white, yellow or greenish diarrhea.

In the last stages of the disease, if the bird lives that long, the intestine may be extremely pale or light in color and the wall may be thin and flabby, but in the early stages the lining of the intestine is red and inflamed.

The average period of incubation of the fungus is approximately 31 days and a throat infection is usually the first sign of the disease to appear.

Where drinking water can be medicated we recommend dissolving eight ounces of copper sulphate in one gallon of warm water, this to be kept in a glass or earthenware container as a stock solution. Add exactly one ounce (2 tablespoons) of this concentrated stock solution to each one gallon of drinking water. The medicated drinking water should preferably be placed in wooden, porcelain or earthenware drinking vessels. If placed in metal vessels these should be allowed to stand, after filling, for forty-eight hours and then washed out, before actual use in the pens. When put into use the solution should be changed at least daily. It is never entirely safe to use metal water fountains with copper sulphate solution but where handled as above our experience has been satisfactory.

The birds receive the medicated water in place of all other water or other liquid for seven to 10 consecutive days, depending on their condition.

In giving this treatment, no extra cod liver oil or other fish oil or mineral oil should be given on the scratch grain or in wet mash within three days of beginning the treatment nor during the treatment. Vitamin oil in the dry mash will not affect the efficiency of the treatment when present

in a normal amount. It should also be noted that the feeding of milk, especially in liquid or condensed form, appears to aggravate the disease. Milk creates a condition favoring mycosis, probably by supplying just the right condition in the digestive tract for the rapid sporulation of the fungus which causes the disease. The normal amount of milk contained in the dry mash will do no harm but milk flushing mashes or the feeding of extra milk should never be permitted during an attack of mycosis.

Many broiler growers and other poultrymen do not have proper equipment to give medication in the drinking water. In this case treatment can be given in the dry mash.

We have had excellent results in such cases by using three pounds of finely powdered copper sulphate and 10 pounds of the following mixture per ton of feed:

1 lb. pulverized gentian
1/4 lb. pulverized ginger
1/4 lb. pulverized saltpeter
1/3 lb. ferrous sulphate
1/4 lb. nux vomica

This may be obtained ready mixed from a number of different poultry supply concerns.

It is extremely important in feeding copper sulphate in the mash, that an extremely fine ground, micro-pulverized material be used. If crystals are used even no larger than the ball in a ball point pen, they will stick to the lining of the digestive system and cause an ulcer to form.

We get a great many inquiries from poultrymen as to what they should expect in the way of production from a good strain of Leghorns in the modern large pen, moreover what should be expected in the way of feed consumption, feed efficiency and cost of feed per bird and per dozen eggs. It is of course impossible to answer this specifically with reference to any particular flock without knowing many things which the correspondent usually does not state, and without being able to forecast the weather, management and many other factors. However, the record attached herewith covers two pens of Single Comb White Leghorns at the research farm, each pen carrying 550 birds. Many poultrymen are keeping a much greater number

Feed and Production Record of Two Pens of Layers Single Comb White Leghorns*

	Pen No. 1	Pen No. 2
No. of birds per pen	550	550
Mortality (%)	15.80	13.90
Eggs per bird	246.25	251.71
Feed consumption		
Grain	34.53	34.62
Mash	45.63	46.30
Pellets	25.45	25.52
TOTAL	105.61	106.44
Feed per doz. eggs (lbs.)	5.15	5.07
Cost of feed per bird	$ 4.47	$ 4.51
Cost of feed per doz. eggs	$ .21	$ .20

* Test started Oct. 14, 1948; Completed Oct. 16, 1949

of birds per pen than in this case but even 550 birds would have been thought quite impractical not so many years ago. So far as we can determine we get as good production from birds in these pens as in any of our pens carrying 200 birds or less per pen and we have had a number of years during which we would compare birds of like breeding and rearing.

It will be noted that the birds in these two pens laid 246.25 eggs and 251.71 eggs per bird in pens 1 and 2 respectively. These pens were on two different rations.

Mortality was higher in the pen giving slightly lower production as will be noted. High production does not by any means necessarily go along with high mortality or vice versa. In fact very frequently the best laying birds show the lowest level of mortality though there is much variation between strains and groups and under different conditions.

It will be noted that in both pens there was a consumption of slightly over 5 lbs. of feed per dozen eggs produced which we consider good for the large type Leghorn such as these. The cost of feed per bird was roughly $4.50 for the year and the cost of feed per dozen eggs 20 and 21 cents which gave a fair opportunity for a respectable profit.

Look to Your Rams!

Condensed from The Farmer

THAT there can be as much as $319 difference in the wool and lamb value of the offspring of one ram in one year as compared to the offspring of another is shown in figures growing out of four years of experimental work at North Dakota Agricultural College.

Earl L. Lasley, M. L. Buchanan, and Merle L. Light, all of the College's Animal Husbandry Department, began their experiment in 1945 and recently completed it.

Because the mainstay of the sheep business in North Dakota, as in most other Middle Western states, is the flock of grade ewes, the three men wanted accurate figures on the differences in meat and wool production between high quality purebred rams of three breeds commonly used in the state: Columbias of two fleece characteristics. Hampshires, and Shropshires. As ewes they got 100 white faced Westerns, and selected their replacement ewes from the offspring of the crosses during the four years of work.

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St. Paul, Minnesota, December 2, 1950

Birth weights of lambs from the various breeds were much the same, but after 30 days the difference in breeding began showing up. By the time 140 days had passed and the lambs were ready for market, the Hampshire-sired lambs were the heaviest with the two Columbia rams running them a close second and the Shropshires far in the rear. Average of four years data on the market lambs show 89.8 pounds for the Hampshires, 88.8 pounds for the Columbia ¼-bloods, 84.8 for the Columbia ½-bloods, and only 77.5 pounds for the Shropshires. Between the highest and the lowest, therefore, there was a difference of 12.3 pounds.

To get figures on wool production the research workers used the replacement ewes, the Hampshire-Western, Shropshire-Western, and the two Columbia-Western crosses. As yearlings, two-year-olds, and three-year-olds the heaviest fleeces were sheared from the two Columbia crosses with the Hampshires second, and the Shropshires last. The ¼-blood Columbia-Western fleeces from two-year-old ewes averaged 12.4 pounds; the ½-blood Columbia-Westerns, 12.2 pounds; the Hampshire-Westerns, 10.4 pounds, and the Shropshires, 8.6 pounds.

For a 50-ewe flock these differences run into substantial totals. There being no significant differences in the size of lamb crop from the four types of rams, figures are based on the average of all of them, 130%. Wool price is figured at 70 cents per pound, and lamb price at 25 cents per pound for all of the crosses in the trials.

Taking a lamb crop of 65 of the Shropshire-Westerns averaging 77.5 pounds, the value of the lambs totals $1,256.87, and the wool from 50 head of two-year-old Shropshire-western cross bred ewes (8.6 pounds @ 70¢) totals $391.30. The total lamb and wool crop value, therefore, is $1,557.87. Figuring on the same basis, the value of the ¼-blood Columbia-Western cross totals $1,877.00; of the ½-blood Columbia-Western cross, $1,804.00, and of the Hampshire-Western cross, $1,823.00.

For a year's lamb and wool crop the figures thus give the ¼-blood Columbia-Westerns a profit margin of $319.13 over the Shropshire-Westerns, $73 over the ½-blood Columbia-Westerns, and $53.75 over the Hampshire-Western crossbreds.

Grassland Farming

Condensed from Ohio Farm and Home Research

Myron A. Bachtell

HIGH yielding meadow crops require more potash than large grain crops. This fact should be thoroughly understood by farmers who are making legume-grass combinations the basis of much of their crop program. The potash which supplies the requirements of meadow crops comes from three sources. These are (1) liberation from the soil, (2) farm manure and (3) commercial fertilizers. The first varies with the soil type and its management; the other two are entirely dependent on the fertility program adopted on any particular farm.

When the farm program on highly fertile soil is changed to permit keeping a larger proportion of the land in high yielding grass crops, there is a considerable increase in the total amount of potash involved in this revamped program. The really big increase, however, is where successful shifting has been made possible by the use of limestone and phosphate. In many cases these have raised soils of low productivity to levels which permit from 3 to 5 tons of hay per acre. Where such changes have taken place they usually have been accompanied by a large increase in the proportion of the winter livestock ration supplied by hay and grass silage. This has raised the question as to what effect this has on the composition of manure, particularly as regards potash.

Two periods at the Trumbull County Experiment Farm give some indication as to what happens when dairy rations are changed from a light hay and heavy grain basis to the almost exact opposite of heavy hay and light grain feeding. This discussion of these two periods is confined mostly to 200 days of winter feeding which constitute the time when manure has to be removed from the barn to the field. It thus is a highly important time from the standpoint of soil fertility maintenance.

Records show that during the 3 years, 1927–1929, the average Holstein cow in the dairy herd at the Trumbull Farm ate the following amounts in 200 winter days; 2400 pounds of clover-timothy hay, 9000 pounds of corn silage and slightly over one ton of grain. High protein oil meals, bran and gluten feed made up 52

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percent of the grain mixture at that time.

When computed from average analyses, the above amounts of feed contain 107 pounds of potash. Earlier experiments at the Ohio Experiment Station had shown that 78 percent of the potash in feeds is excreted in the manure by dairy cows. This proportion would result in 83 pounds of potash in the excrement of each dairy cow for the 200-day feeding period. In addition to this, there were 22 pounds of potash in the straw used for bedding. This makes a total of 105 pounds of potash.

In another experiment at the Ohio Experiment Station all feed was weighed and fed under cover to steers. All manure produced by the steers was weighed. The result was that the manure hauled out was one and one-half times as heavy as the air-dry weight of the feed and bedding. On this basis the manure production per cow at the Trumbull Farm during this early period was 7.8 tons with each ton averaging 13.5 pounds of potash.

One other factor should be considered. During this period when grass was a minor part of the ration the Trumbull County Experiment Farm was able to carry only 14 cows in the dairy herd. When this number is multiplied by the manure content of 105 pounds of potash per cow the result is 1470 pounds of potash per milking herd. The 1470 pounds represents the possible amount that might be returned to the soil with good manure management. This should be considered a revolving fund of potash that comes from the soil and goes back to the soil to again play its role in crop production. This amount is to be compared with a similar figure obtained for the later period in which hay played a much more prominent role in the winter feeding program.

Starting about 1930, the Trumbull County Experiment Farm began a practice that many dairymen later adopted. In brief, this was to lime the soil to a point where alfalfa had some chance of being successfully grown with timothy. In later years, Ladino clover was added in order to be a little more sure of having a legume-timothy mixture for the 2 or 3 years that the meadows were cut for hay. This practice made it possible to grow almost any amount of hay desired, merely by increasing the number of years the meadows were kept for hay.

Naturally if the hay was there it was desirable to feed it. Evidence soon piled up that the dairy ration could be changed to include more hay. The data from the 3 years, 1940–1942, give an idea of what the change meant. The 200-day winter feed per cow averaged 6000 pounds of alfalfa-clover-timothy hay, 4000 pounds of corn silage

and 1140 pounds of grain. Furthermore this grain mixture contained only 24 percent of high protein meals.

The potash content of a winter's feed averaged 135 pounds per cow when fed this heavy-hay ration. With 78 percent passing through the animal there was excreted 105 pounds by each cow. Adding 22 pounds of potash in the bedding raised the amount in the manure to 127 pounds per cow. The extra hay in the ration during this period increased the air-dry weight of feed consumed. Consequently, the weight of manure was increased to 9 tons per cow with a computed potash content of 14 pounds per ton.

The comparison thus far has not shown any striking differences. Most noticeable is the increase in potash from 105 to 127 pounds in the manure per cow. The computed weight of manure changed from 7.8 to an even 9 tons but the potash content per ton of manure showed very little change.

The most important consideration is the change in the number of cows involved. Heavy liming and a greater use of perennial meadow mixtures increased feed production and made it possible to carry a larger dairy herd. During the latter period, 1940–1942, the herd averaged 19 cows for the 3 years. With 127 pounds of potash in the manure from each cow the total for 19 cows would be slightly over 2400 pounds for the herd. This is a striking increase from the 1470 pounds computed for the previous period. Neither is this the entire story. Since 1942 the carrying capacity of the farm has been increased still more. Now it is felt that 25 cows can be carried safely. In fact, during one recent year the number was even larger. The manure from this larger herd, fed more largely on grass products, contains more than twice as much potash as that from the smaller herd 15 years earlier when hay received much less consideration.

Thus far the discussion has centered around 200 days of winter feeding. Records at the Trumbull Farm show that during another 100 days of summer, the dairy herd obtained a very substantial part of its feed from rotation meadows. These were cut for hay in June and the aftermath pastured in a well-managed scheme which kept the yearly forage production high for the 2 or 3 years of meadow. This is mentioned because the story of potash is not complete without recognizing the fact that this plant food has an important bearing on the successful retention of legumes in meadows for varying periods.

Consequently, the 2400 pounds of potash mentioned above is not the total involved for the one year on the Trumbull Farm. Some should be added to that figure to

cover the amount involved in the summer pasture. Then to get the total for the farm as a whole, an additional amount should be added for young stock being raised for replacements. These combined amounts might total somewhere between 4000 and 5000 pounds of potash for this single dairy farm. Furthermore, this latter estimate is only 78 percent of the total amount of potash involved in the crops grown and fed on the Trumbull Farm. It is necessary to add a fourth to obtain the real total.

On many soils, the 22 percent going off the farm through sales of milk and livestock can be supplied through the annual release from the rather large amount in the soil. But for the long pull over a couple of decades or for a lifetime, the level of potash in the farmers' revolving fund will be determined by the plan adopted for taking care of manure. Unless potash supplies are kept well replenished, the level of grass yields ultimately will decline. In fact, some recent investigators explain the gradual change in vegetation by available supplies of potash. Thus legumes fade out of legume-grass combinations sooner than they should because the grass is able to pick up the existing inadequate supplies of potash before the legumes. Then as the supply becomes even less adequate, weeds are able to get this small supply before the grass.

Emphasis thus must be placed on the fact that more potash is involved in grassland farming than in grain production. It is well known that potash in manure is highly soluble. Escape of urine or exposure of manure to rain in the barnyard leads to serious potash losses. Because more potash is involved in grassland farming it is even more important to emphasize the need to have a plan of manure management that assures getting practically all of the excreted potash back on the land.

Minor potash deficiencies can be made up by purchases in commercial form, and in many cases some buying is logical. However, too great reliance on this source may be unwise and needlessly expensive. Potash supplies in manure are larger and more reliable than in commercial fertilizer. Neither wars nor strikes can shut off the supply of manure but there have been recent periods when potash purchases were difficult to make.

Dairy Research Work Expands

Condensed from Certified Milk

Dr. O. E. Reed

Chief, Bureau of Dairy Industry, U. S. Dept. of Agriculture

PROBABLY the most significant fact with respect to the dairy industry today is that we are not producing as much milk per person as we did five years ago, or even 10 years ago, yet the industry is faced with surpluses of certain dairy products at the present time. In spite of the fact that total milk production is now about 12 per cent higher than it was 10 years ago, milk production per capita has not kept pace with the increase in population. In 1940 we produced 830 pounds of milk for every person; in 1945 we produced 870 pounds; but in 1949 we produced only 798 pounds, which was 72 pounds less than five years ago. The principal reason for the apparent surpluses is the high price in relation to what the consumer is willing or able to pay.

As you know, the surplus problem is not confined to the dairy industry. At times it requires serious consideration in many other branches of agriculture. Research workers in the Bureau of Dairy Industry, or elsewhere, cannot solve the surplus problem in its entirety, but they can help. In fact, research information is basic to most other efforts to move surplus production into consumption, whether these efforts are made through the Government program or by the industry itself. In 1946, when Congress passed the Agricultural Research and Marketing Act, it recognized the importance of intensive research as a means of increasing consumption of the products of the farm. They recommended research to increase the efficiency of milk production so that an abundance of dairy products might be available to consumers at reasonable prices and at the same time maintain satisfactory returns to the producer.

For many years we have felt that the development of higher producing dairy cows offered the greatest possibiilty for reducing the cost of milk production on the farm. Through more than 30 years of proved-sire breeding at our Beltsville experimental farm we have demonstrated the soundness of using progency-tested sires, or the sons of such sires, in breeding up the producing capacity of a herd. Today, the proved sire is

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New York City, New York, October 1950

in greater demand than the supply, and such sires are particularly sought after for artificial breeding. The dairy-herd-improvement associations in most States are doing splendid work in proving sires in the association herds. The dam-and-daughter records come to the Bureau for tabulation, and through this nation-wide cooperative sire-proving program the industry is getting a line on some 5,000 bulls each year.

The development of artificial-breeding organizations affords a way to extend the use of the most desirable sires to many more cows and herds than is possible by natural mating. This year about three million cows will be bred artificially in the United States, which is more than 10 per cent of the present cow population. Because the proved sire is the key to herd improvement, and because the demand for good sires is greater than the supply, research is now under way to develop ways to prove more bulls and to prove them more rapidly and more accurately.

Under the provisions of the Research Marketing Act, the Bureau is also taking part in several regional projects dealing with cattle breeding problems. This work involves more or less fundamental research and is being done in cooperation with the state experiment stations in specific regions. For example, as a part of the North Central Regional Dairy Cattle Breeding Project, we are cooperating with the Illinois station to study the comparative value of cross-breeding. The object is to find out which method affords the small dairymen in this region the better opportunity for developing high-producing herds. Another phase of this regional project is under way at the Indiana station, where Red Dane milking cattle are being crossed with the popular Red Polled and Milking Shorthorn dual-purpose breeds. The object of this crossing work is to improve the milking qualities of the dual-purpose breeds, and at the same time develop a cow for Indiana farmers that will be capable of producing a good red colored beef steer for the market. Also at this station we aim to study the relationship between certain characteristics of type and producing ability.

At the Minnesota station, the cooperative work consists of developing intensely inbred lines and then crossing the inbred lines, to determine whether this system of breeding can be used successfully by farmers to produce superior milking animals. At the Wisconsin station, inbred and outbred lines of Holsteins are being developed from the same foundation stock which, when stabilized, will be intermated to determine whether this system of breeding has any advantages over outbreeding. In-

vestigations are also under way here to develop ways of proving bulls at earlier ages than is possible at present. At the Ohio station, work is under way to develop superior strains of dairy cattle by line breeding, interline breeding, and reciprocal crossing; and to explore the possibilities of developing new and improved methods, such as blood typing, for identifying superior germ plasm in the young calf. The Bureau is also cooperating with several state stations in the Northeastern Regional Project and in the Western Regional Project on Factors that Contribute to Reproductive Failure in Dairy Cattle, including a study of the biochemical, anatomical, and physiological factors involved in reproductive performance. Part of this work is being done at Cornell University and part at the Beltsville Research Center. Cooperative work with the New Jersey station in this project includes a study of certain hormones and hormone-like materials excreted in the dairy cow, the levels of excretion, the relation of these materials to reproductive capacity, and the factors affecting the excretion of these materials.

The cooperative work at the Connecticut station includes a study of the breeding and reproductive records that have accumulated in the station's herds over a period of 20 to 25 years, to determine what relation, if any, there may be between inheritance and infertility. One phase of this work is the development of a suitable formula for expressing reproductive efficiency in the cow. At the Colorado station, our cooperative effort includes a study of the nutritive materials in bull semen and their relation to the viability and storability of the semen, and also to the reproductive performance of the bull. This is a part of the Western Regional Project on sterility in dairy cattle. I have mentioned these various phases of breeding research, and the cooperative work, to give you an idea of the scope and intensity of the research effort to improve the economy of milk production on the farm. We not only need to improve the production inheritance of our cattle by breeding, but we also need to know how to manage our herds so as to avoid the large losses that result from breeding and reproductive failures.

Another breeding project—one in which dairymen in the hotter parts of the country will be particularly interested—is our effort to develop strains of dairy cattle that will produce under the high temperature and high humidity conditions of the South. We are attempting to accomplish this by infusing the blood of the Red Sindhi—which is a heat resistant milking strain of Brahman cattle in India—into our present breeds.

This breeding project, which is now a part of the Southern Regional Breeding Project, was our first project under the RMA program. We began by importing four Red Sindhi animals—two bulls and two heifers—from Indiana late in 1946. We mated the bulls to some of our high-producing Jersey cows at Beltsville, and we now have 11 crossbred heifers in milk. None has yet completed a full lactation period, but so far most of them are producing at a surprisingly high rate. The first three heifers, in their first six months, have exceeded the production of their purebred Jersey dams. As young calves they showed more ability to tolerate high temperature and humidity conditions that the purebred calves.

As a result of mating the Red Sindhi bulls to the Jersey cows we now have around 45 crossbred females of various ages. Some of these are at Beltsville, but some are at our cooperative experiment station at Jeanerette, Louisiana, where we will make further comparison with purebred calves for heat resistance and milk production. Some of the 50-50 crossbreds are being mated to the Red Sindhi bulls to get calves with three-fourths Red Sindhi inheritance, and some are being bred to Jersey bulls to get one-fourth Red Sindhi inheritance.

Eventually we hope to determine what percentage of Red Sindhi inheritance will be necessary to maintain satisfactory heat resistance, and then to develop a program of breeding that will produce better cattle for the South. In addition to the basic project at Jeannerette, which we are conducting in cooperation with the Louisiana Agricultural Experiment Station, the cooperative work includes a project at Homer, Louisiana, where the Red Sindhis are being crossed with Brown Swiss, and a project at Baton Rouge where they are being crossed with Holsteins. Also, we have supplied crossbred Sindhi—Jersey bulls to the Georgia and Florida stations for crossing with other dairy breeds.

Another phase of the cooperative work is in progress at the Texas Agricultural Experiment Station, where native Brahman cows are being mated to proved Jersey sires to explore the possibilities of increasing milk production along with heat resistance in the native Texas cattle. In still another phase of the project, we are cooperating with the South Carolina Agricultural Experiment Station in an effort to develop, through breeding and selection, heat-resistant strains of dairy cattle by pure-line breeding with several of the dairy breeds, such as Holsteins, Guernseys, Brown Swiss, and Ayrshires. This cooperative work is all part of the Southern

Regional Dairy Cattle Breeding Project. There is need also for breeding work of a similar nature to develop cattle that are better adapted to the environmental conditions of other areas. Still other research should be undertaken to develop dairy cattle that will be better adapted to a grassland farming system—that is, cattle that will be able to sustain themselves more completely on grassland crops alone.

Less Work and More Hens

Condensed from Eastern States Cooperater

G. T. Klein
University of Massachusetts

A GREAT ARMY of efficiency experts is at work on poultry farms. They are not recognized. as such but their contributions are making poultry raising comparable to the machine age of industry.

Time saving has a universal appeal. The big fellow wants to cut his labor bill. The little fellow has an eye on getting away from carrying water, lugging bags of feed, shoveling heavy litter and cleaning dirty eggs.

Changes have come fast, so fast, in fact, that it has been almost impossible to keep pace with the progress.

There are alternate ways of doing most things. The choice is a matter of preference. Today's keen competition calls for a careful appraisal of the probable returns before expenditures are made. An investment in new gadgets or remodeling a building might be very foolish, or it might be a well-paying investment. It pays to give it careful thought.

It can be stated with no hesitation that large pens, dry litter, running water, easy feeding are "musts". Automatic brooding heat, handy egg rooms, carry a high priority.

Here, then, is a rundown of these time savers with an attempt at appraisals:

Size of Pens: Large pens save labor. But, like most good things, there are disadvantages. It appears that about 50 feet may be a good maximum width, while a pen 100 feet long is large enough to give the advantages of large size.

There probably are few advantages in going beyond a certain

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size in "bigness". There is the danger of weakening the building when all partitions are omitted. It is also far more of a problem to catch birds for culling, vaccinating and bloodtesting in the big pens. Then, too, the snow load that an extremely large flat roof might have to carry is a problem to be reckoned with. There is also the danger of hurricane damage.

The University of Massachusetts has plans for laying pens 40 and 48 feet wide, a laying shelter 40 feet wide . . . and we're coming up soon with a broiler house plan 48 feet wide. These are, of course, in addition to the smaller sizes starting with a 12-bird backyard house.

Single and Multi-story Houses: Conventional laying houses that are to be used the year round and are to be completely insulated are probably cheaper to build in multi-story construction. Laying shelters and broiler houses with no insulation, unless it be the ceiling, appear cheaper in single story construction. It has never been decided one way or another if there is a labor difference in doing chores with birds housed in single or multi-story houses. If there is a difference one way or another, it probably is slight.

Mechanical vs. Hand Feeding: A recent survey of poultrymen using mechanical feeders revealed almost 100 percent satisfaction. There are mechanical imperfections which are being corrected, but few, if any, of the users would give them up. Most rate them as labor savers, some as feed savers.

Ted Day, East Pepperell, Massachusetts, puts it this way: Cost is about $500 a thousand layers for an installation. If they last five years, the yearly cost is 10 cents a layer, far less for a chick. Three hours daily saved gives more time to watch for culls, grade eggs and do other jobs on the farm.

The feeling is generally that mechanical feeders should get serious consideration when equipping a new house. It takes close figuring when making a decision on discarding conventional feeders and carriers and going to automatics. Labor saving is greater in brooder houses than in laying pens. There is little or no difference in rate of growth or production on the two systems.

Houses that are 100 feet long or longer ought to have either carriers or mechanical feeders.

Feed Room Efficiency: Much heavy lifting in the feed room can be saved with hoists and elevators. Hoists look like the best buy. They are available in hand-operated gadgets costing about $50 and in electric hoists costing $300 to $500. These are needed only in buildings having more than two stories.

It isn't necessary to do much lifting of feed bags to fill carriers

or the drums of automatic feeders. Carriers can be filled without lifting bags by making use of elevated feed room floors. Automatic feeders can be filled from the floor above by using a chute to the drum. Usually the drum of a mechanical feeder can be set in the feed room to avoid feed carrying if there is no feed room overhead as in a one-story house.

Dry Litter: Years ago it was found that fresh litter does not stay dry in capacity-filled pens in cold weather. This same type of litter, however, put in houses early in the season, finely-ground and mixed with dry poultry manure, stays drier. Hydrated lime was found to prevent litter particles from sticking together. It has become a standard practice to add about a pound of lime for each bird, applying it in two or three fall applications. Stirring with a fork, a mechanical stirrer or by the birds' scratching were also found to be dry litter aids.

Then came using litter for more than one year or for more than one brood of chicks. This proved to be a great labor saver, but was accompanied by some disease hazards. And on the favorable side was the discovery that important vitamins are present in the poultry manure in the litter.

Litter becomes harmful only when there are organisms of dangerous diseases in it. These include cholera, typhoid and a few others.

Another old litter difficulty is the high ammonia content. This can be harmful to the eyes of chicks in cold weather. New litter for winter broods looks like a good thing, but there are ways of reusing litter to a considerable extent without great danger. Ventilation and dryness are important in preventing this trouble.

Dry laying house litter may not be much of a factor in higher production or even in flock health. Dryness is all-important for clean eggs.

Nests and Labor Saving: The Massachusetts Clean Egg Nest, I am confident, is the best nest that can be used for time saving, clean eggs, and low egg breakage. Pullets should be housed before they start production or be started with this type of nest on range. Otherwise there will be too many floor eggs.

There should not be too much litter on the floor when production starts. At least there should not be enough to make an inviting laying spot under the nest. It may be best to board this off for a few weeks. Turning lights on around 5 a.m. will get considerable nest laying of eggs that would otherwise be dropped in the litter or on the roosts.

Shavings, sawdust, and sugarcane are the best of the nest litters. When floor litter is wet, such commercial floor litters as "Chick Bed" will dry the birds' feet and

give more clean eggs. Lime boxes in front of the nests are good foot cleaners in wet pens.

Waterers: Waterers need to be considered from the standpoint of non-freezing as well as non-throwing. There is considerable good that can be said for angle-iron waterers running the entire length of a pen. These are set for continuous water flow with a shallow water level. When birds cannot wet the face and wattle, there is not much water throwing.

Egg Gathering and Egg Rooms: The only way to save time in gathering is to use a carrier. It should run from near the first floor egg room through the center of the pen. There is no way to bunch the nests without increasing floor laying. The wall area seems to be the best place and an even distribution of the nests appears to work best.

An egg room should never be higher than the first floor of a building because of ammonia fumes. It gives better holding conditions if on the north side and partially, at least, underground.

Roostless Pens: Hundreds of poultrymen have discarded roosts. They rate this, however, as a cut in construction and upkeep expense rather than labor saving. Some, after taking the roosts out, put them back. Many, however, want no part of them again.

How do these developments add up in modern poultry farming efficiency? In handling layers, egg gathering and grading is what usually clamps the limit on a worker. It appears that with an ideal setup, 6000 birds is about the upper limit if the flock hits a high rate of lay.

And in brooder houses, a worker can handle around 40,000 birds. He will need extra help in the case of breakdowns or jams and for the cleanout.

Hot water and hot air brooding are among the best of the time savers. If the installations are right, they are fuel savers, too. Recent improvements are outstanding.

These figures certainly qualify poultry raising for a place in the machine age.

A New Rat Destroyer

Condensed from the American Agriculturist

L. E. Weaver

POULTRYMEN wage almost constant war on rats by means of cats, traps, poisons and attempts at rat-proofing buildings. Their efforts certainly go a long way toward holding this ancient enemy of mankind in check, but probably never can be entirely successful. Rats are wary and wise and resourceful, and they are migratory. You might get rid of the last rat on your place today and still have some around tomorrow because of a new immigration tonight. It is always good news when a new weapon becomes available for this war on rats. The newest is "warfarin" and it works in a new way.

The letters W-A-R-F are the initials of the Wisconsin Alumni Research Foundation. Warfarin is a chemical developed in the Department of Biochemistry at the University of Wisconsin, where its rat-killing properties were discovered. It is a powder without taste or odor, and does not dissolve in water. Mixed in very small amounts with corn meal, or other baits that cannot be carried away, the rats will continue to eat it. Apparently they do not associate their condition with the bait. The reason for this probably is that the poison does not act at once. Continued feeding for 5 days or more is necessary. The chemical prevents the blood from clotting, and the rats eventually die a painless death from internal hemorrhage.

Extensive tests of the new poison have been made over a two-year period in order to get the answers to such questions as, Will it harm livestock and pets? How much is needed? What bait is best? Will it make other rat poisons unnecessary? Here are the answers in brief:

Single doses, even in large amounts, will not harm pets or larger animals. Cats or dogs might eat rats or mice killed by warfarin and still not be harmed unless it was their only diet for 4 days or more. Use bait material that is not relished by cats and dogs and that can be left several days without spoiling. A mixture of oatmeal and corn meal (50-50) has been suggested; also freshly ground corn meal. Another suggestion is white bread crumbs. It may require up to 10 pounds for a badly infested place.

The amount needed will depend

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on the number of buildings. Large buildings should have two feeding stations; corn cribs, brooder houses, etc., should have one. Leave the bait in place for at least two weeks—about a pound in each place.

Warfarin should be used in addition to other poisons that act quickly. Let red squill or antu make the first heavy kill, and let warfarin be the mopper-upper. It is now on the market under various trade names.

One Tool Does Three Jobs

Condensed from The Southern Planter

Gene Smith Moody
Agricultural Experiment Station, Virginia Polytechnic Institute

A MULTIPLE-USE drill, which in one trip over the land does a complete job of preparing the seed-bed, planting grain, and applying fertilizer has undergone its third year of tests at Virginia Agricultural Experiment Station.

J. H. Lillard and J. N. Jones, Jr., soil conservation researchers at the station, say the tractor-towed machine is essentially a field type cultivator or ripper with a grain and fertilizer box mounted on it. Tubes from the box lead to a "boot" on the rear of each opener.

The drill is highly effective as a conservation tool because it leaves most of the preceding crop residue on the surface as a mulch. It was developed by the Tennessee Valley Authority in cooperation with certain farm machinery companies and the Virginia station, and with other states in the TVA area.

Only experimental models have been built so far, and Lillard and Jones say many mechanical refinements are needed for efficient field operation.

They believe, however, that its future commercial production is insured by its demonstrated ability as a soil and water conservation tool, and as a machine to do the complete job of soil preparation, seeding and fertilizing at a big saving of time and labor.

The machine's development was prompted by the need for better small grain tillage practices to improve protection against soil and water losses; and for a means of seeding supplemental winter pastures without destroying existing land cover.

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Richmond, Virginia, October 1950

In developing the drill, researchers bore in mind the fact that seeding of small grains and supplemental pastures comes at a busy farm season. The job must be completed in a relatively short seed time, and with minimum labor requirements.

Compared to discing and seeding with a conventional grain drill, no yield reductions were noted in several seasons of testing the machine in production of small grains seeded on both corn and lespedeza stubble.

A study of the overall mulch tillage problem indicated the only place a reduction in yield is likely to occur is where the machine is used in a stubble of perennial grasses and legumes. Here, the competition for food and moisture usually reduces the grain yield.

Tests are underway in which the machine is used to seed barley in an established alfalfa crop for winter grazing. Damage to the alfalfa in the seeding operation appears negligible.

In other current tests, mixtures of barley, oats and wheat were seeded in lespedeza and corn stubble. In one area, the machine worked successfully in seeding ryegrass in an established bluegrass and white clover pasture without serious injury to the existing protective land cover.

What a Pasture System!

Condensed from Successful Farming

Albert B. Foster

Ben Moy of Buffalo County, Wisconsin, has proved that milk can be produced on a straight roughage diet 10 months out of the year—and with no grain for dessert.

His recipe is: "Let 'em eat grass," and his cows are living examples of this unorthodox but highly satisfying way of farming. The June day we visited his 240-acre farm, his herd of 31 holsteins came into the lot from knee-deep alfalfa-brome pastures with their bellies full.

They produced 1,300 pounds of milk that day, and had been doing it right along. And not a bite of grain or concentrate. Moy has quit growing corn, except for a 7-acre bottom field he uses for silage.

Most amazing of all is that he goes through the winter without feeding grain except for about two months. The cows are given

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Des Moines, Iowa, October 1950

a little grain and concentrate for a few weeks just to build them up before they freshen in the spring.

Moy's entire feed menu last winter was 4 tons of 35 per cent protein concentrate purchased for $400, and 800 bushels of home-grown oats. The rest was hay and a little corn silage from the 7-acres. He bought no grain. He sold $9,425 worth of milk and livestock last year.

"My land is getting better all the time," Moy happily reports, "and I am saving on labor and machinery by farming this way." When asked his formula for such a program he answered, "High-quality hay and pasture. There's nothing to it, once you get started; it's much easier than the old way."

These are some of the main ideas you get when you see this farm and talk to this man about grass farming. He is producing milk and making money, without feeding grain for 10 months of the year. His land is getting better, and erosion is a thing of the past. And he does not work so hard.

Let's examine a few of these points in Moy's farming. Soil conservation, for example. Moy's farm is in the rough area of western Wisconsin. It is rolling. Some of it is steep. Moy is grass-farming slopes as steep as 25 per cent. Of the 240 total acres, only 136 acres are usable for farming. The rest is woods and poorly drained pasture. None of it, except the bottom land, slopes less than 7 or 8 feet in 100.

"It's a shame the way this farm looked fifteen years ago," Moy told us. "I actually had to plow in ditches every summer before I could cut grain with power machinery."

Today, he crosses every draw with any implement on the place. He didn't do this by damming the ditches and letting them fill up. In following recommendations of the Soil Conservation Service, he simply plowed the ditches in and seeded them to grass. By renovating the whole field, he has improved the cover so much that very little water runs off the slopes.

Thus, Moy is a true soil conservationist. He enjoys looking over his fields after a gully-washer rain and finding the soil safe and alive under a blanket of roots and organic matter.

"It would take 30 years to lose as much soil with grass farming as I lost in one year under the old system," was the way he put it.

Here is how Moy gets such a cover of forage: When the field is in grass, he spreads lime on top of the sod according to need indicated by soil tests. He then discs both ways—in September, if possible—using plenty of weight and setting the disc nearly straight. This cuts the old soil into small squares.

Then he goes over the field with a spring-tooth field cultivator.

After these operations, he spreads 300 pounds of 3–12–12 fertilizer. He tries to come back with the spring-tooth just b e f o r e the ground freezes up. This kills quackgrass.

As early in the spring as possible, he uses the field cultivator again and seeds 2 bushels of oats, 12 pounds of brome, and 7 pounds of alfalfa per acre. The oats and brome are mixed and seeded with a grain drill. The alfalfa is planted with a seeding attachment on a cultipacker. Getting the ground firmly packed is an important point.

After that, nature takes its course. The fall working kills all the grass—even quackgrass. We walked over a field seeded two years ago. You could still see the decayed pieces of old sod. They were holding moisture like so many sponges. Brome and alfalfa were growing right through them. Moy prefers brome and alfalfa because they do not need reseeding every two years.

He started five years ago, renovating a field each year. He has now made the complete circuit of the farm, and the first field is still going strong. If just top-dressing with a complete fertilizer will keep this original stand growing, that is what he will do. If not, then he will renovate as before.

Moy's oats is yielding at least 20 per cent more than before. One field made 80 bushels to the acre.

Ben Moy was one of the first farmers to have a complete farm conservation plan in the Buffalo County Soil Conservation District, organized in 1940. Lloyd "Lefty" Wilbur, Soil Conservation Service farm planner, helped Ben work out a plan on his 240-acre farm. The scheme called for strip cropping on the cropland, woods and pasture on the steeper land, and some wildlife plantings in the gullies and along the edge of the woods.

Five years ago, after following the strip-cropping method for three years, Moy decided not to plow up the strips any more. When the time came for plowing up a strip in meadow, he just left it in hay.

Ben cuts meadow when it makes the best quality hay—early, before the fibers get tough. The combination of brome and alfalfa is ideal for hay and pasture. The alfalfa stimulates the growth of the brome and keeps it from becoming sod bound. He has had no trouble with bloat since he put brome in the mixture. With his present herd, he makes only one hay cutting a year. Then it is up to the cows to harvest the rest.

Moy starts pasturing in the spring on the rough fields and on the fields that were renovated first; that is, the old stands. These fields are used only for pasture.

Last spring he put his 31 cows on a 30-acre field of old alfalfa

and brome about May 20. This carried them until another field of 27 acres, which had been seeded to oats, brome, and alfalfa, could be used. The second field was too rough to harvest the oats, so the oats crop was pastured off. This helped the new seeding as compared to permitting the oats to mature. By rotating back and forth on these two fields, he was able to provide the cows plenty of pasture until a new hay crop was cut on another field the last week in June.

After a hay crop is cut, the aftermath is available for pasture. Then, as other hay-fields are cut, he has additional fields for pasture. No second crops of hay are harvested so there is plenty of pasture even though the weather may get a little dry in July and August.

Ben figures about three tons of hay will take each mature cow through the winter. This depends on the season, of course, but usually he can pasture until around September 15. Then after giving the field some rest, he can pasture lightly until snow falls.

He has the fences planned to permit changing the cows from one field to another as needed. The length of time he leaves the cows in one pasture depends largely on the weather. But changing pastures is one of the main factors in the success of grass farming. Moy never lets the cows into a pasture until it is at least 6 inches high, and always takes them out before they eat it shorter than 2 or 3 inches.

Moy now has 31 cows, eleven 2-year-olds, and nine heifers. This figures out about one animal unit for each three acres. He plans to increase this to one animal unit for each two acres. Right now he has surplus feed and is selling hay.

He gets a kick out of telling how a G.I. teacher and his class from another county visited his farm early in June. The weather had been dry and he overheard some of them saying that they wanted to see how this grass farmer was making out during the dry spell. Before they left, he had sold them 60 tons of hay!

The Moys have time to do custom work for the neighbors. Last year, they baled 750 tons of hay and combined 175 acres of oats away from home. The reason for this, according to Ben, is that grass farming requires at least 20 per cent less labor, and the work is more evenly distributed over the year.

Fans Solve Ventilating Problems

Condensed from the American Poultry Journal

John C. Brown

THE best egg production is secured with birds that are comfortable and happy. The comfort of the hen is, to a large extent, directly dependent upon the kind of house she occupies. Most of her time is spent there, and it is there that she receives most of her care. Good egg production demands that the bird be kept contented and in surroundings conducive to good health.

An important factor in securing comfort for the birds is an ample supply of pure air. As a disease-preventive, health promoter, and a factor in good production, pure air stands high in importance. Possibly nothing used by poultrymen in an attempt to secure good production is cheaper.

Supplying fresh and pure air in the poultry house requires some type of ventilating system. Until recently, poultry house ventilation has been a problem. Gravity or natural methods of ventilation have never been entirely satisfactory, since they are dependent upon a number of factors such as insulation of the house, outside temperature, the direction and velocity of the wind, and the amount of heat given off by the birds.

Besides, the properly designed system of gravity ventilation is not only relatively expensive to install, but requires constant attention to keep it operating properly under changing weather conditions, since automatic control is not practical. But now, with just a few dollars for a fan and with good management, the poultryman can have his ventilating problem solved.

Poultry house ventilation with fans is effective, thorough, automatically controlled, provides fresh air without drafts, eliminates the labor and cost of frequent replacement of the litter, and lessens the danger of decay in the building structure.

Fans offer the possibility of more accurate temperature control in poultry houses because of their ability to be controlled thermostatically and operated automatically. This is of especial value in brooder houses, particularly where large numbers of chicks are being brooded together. For example, when the temperature in a brooder house rises to, say, 80 degrees, and the thermostat has been set at this

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figure, the fans will automatically start and the temperature is relieved. Operation of the fans will also relieve the air of dust. They are of especial help in warm weather.

Before fan ventilation is installed, certain requirements must be met if maximum satisfactory performance is to be expected. The first consideration should be the building itself. No fan can be expected to compete with a multitude of cracks and openings that let the wind in and out at will.

A well-built house, preferably one that is insulated, may cost a little more to construct, but in the end it will pay dividends. Other requirements are insulated floors, no overcrowding of birds, and a minimum of spillage of drinking fountains. These are necessary or the fans won't be able to compete with the excess amount of moisture. If these requirements are met, a fan ventilating system can be expected to provide satisfactory ventilation.

The size of the fan to use is determined by the capacity of the house. Fans are rated in cubic feet per minute. One cubic foot of air per minute per bird will provide a sufficient amount of air to carry off the moisture-laden air without excessive loss of heat to the interior of the house. Thus, for 500 hens, the ventilating fan or fans should have a capacity of approximately 500 c.f.m.

Where possible, the fans should be installed near the ceiling on the side of the building away from the prevailing winds. If this is not possible, some sort of shield or hood should be placed over the shutter to prevent any backdraft. The fan should be surrounded with an exhaust flue built of insulating board, plywood, or similar material, extending from above the fan opening to within 15 inches from the floor in order to eliminate drafts. The ducts should be as nearly square as possible, with a cross section twice the area of the fan wheel. It should have a door at top opposite the fan for removal of warm air in the summertime, and for use in servicing the fan.

The size and location of the air intakes is important to prevent drafts and to permit the introduction of the proper amount of air. The intakes should be located on the side of the building opposite to that where the fan is installed, so that the incoming air will be drawn across all sections of the pen. Intakes should be 8 to 10 ft. from each other; when a large number of intakes are necessary, it may be desirable to locate some of them on the same side as the fan to secure complete coverage of the pen area. In no case, however, should an intake be within 8 ft. of the fan. This would result in the air coming in the intake and going right out

through the fan, leaving the rest of the pen unventilated. Intakes should not be more than 30 inches above the floor. Approximately 10 sq. in. of intake should be provided for each 100 sq. ft. of floor space.

Windows may be used as air intakes, provided the necessary precautions can be taken to prevent drafts. If double-hung windows are used, the lower sash can be raised to act as an intake provided a board is placed across the opening to serve as a baffle to prevent the cold air from sweeping directly across the floor. Tip-in windows can be used as air intakes provided the baffle board is placed at the ceiling in front of the window to deflect the air downward. When windows are used as air intakes, the poultryman may have to make some adjustments in the size of the openings until experience shows the most satisfactory setting for the pen involved.

When installing a fan ventilating system, consider very carefully the quality of the fan you purchase. This is the heart of your system, and satisfactory results depend on the proper operation of it. It must be able to operate 24 hours a day, day in and day out through a whole season without any attention. It should not require frequent lubrication. It should not have any parts that wear down quickly and require replacing. It must not overheat. It must not be affected by the moisture and dust in the air that is being exhausted. If these requirements for the fan ventilating system are met, any poultryman may have a comfortable and properly ventilated poultry house.

War on Nematodes

Condensed from The Nation's Agriculture

Dr. George D. Scarseth

NEMATODES have probably been one of man's worst enemies down through the ages. Nematodes take over usually as a farming area becomes older and more than any other factor, may have been the chief killer of great civilizations by destroying food crops. Nematodes are becoming too serious for comfort in the soils of America.

Ask Dr. G. Steiner, one of the very few nematode authorities in the world, who is in the U.S.D.A.

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Laboratories at Beltsville, Maryland, about nematodes and he will tell you that nematodes are responsible for most of the troubles where farmers complain of soils that are "alfalfa sick", "clover sick", "tired of potatoes", "tired of beets", etc.

Nematodes are worms so small that they can be seen only under a powerful microscope. If 100 nematodes were lined up end to end the whole parade would be only about an inch long.

Since nematodes are probably costing farmers from hundreds to thousands of dollars per farm, and are a serious handicap to our national economy, why haven't we heard more about them?

Because man has developed entomology to study insects, and has developed pathology to study diseases caused by bacteria, fungi, virus, etc., but the nematodes belong to neither of these fields of study and have lived quite free of attention except for a small corps of quietly working scientific specialists. Therefore, with so little widespread knowledge about nematodes, courses for study and widespread research on nematodes have not been developed in our colleges and universities. It appears highly important that substantial encouragment be given to promote further development in this neglected corner of our agricultural sciences.

The writer awakened to the importance of parasitic nematodes about three years ago when in Central America with L. E. Richardson, R. E. Lucas and Stephan Kliman. We became aware that the nematodes were our number one problem in growing bananas. An early nematode scientist, N. A. Cobb, had noted on a trip to the East Indies that nematodes were responsible for some plant troubles, but his discoveries were largely unnoticed by agronomists. In the last three years the writer has made microscopic examinations of roots of crops over widely scattered areas of the U. S. A. We have found positive nematode trouble everywhere, especially affecting the legumes, vegetable crops and tobacco.

Where crops have been grown for several years, parasitic nematodes are likely to have increased to the extent that crops do not respond to fertilizers as they should.

We have found cases where the soils were well supplied with phosphate, but too little phosphate was getting into the plant tissues, as indicated by tissue tests, because the feeding roots were pruned too much by meadow nematodes. Where the meadow nematode had pruned the feeding roots, the phosphate could not enter the plant even though it was present in adequate quantities in the soil.

The root-knot nematode is easily recognized by the swollen roots,

but the meadow nematodes are not so easily recognized, except that they may cause brown patches or wounds on the larger roots after the damage is considerably advanced.

The writer now has some reason to believe that poor stands of red clover and frequent failures to obtain a stand of clover following soybeans may be caused by nematodes. This suspicion should be investigated.

This last season, we found evidence of meadow nematodes in some of the clover seed producing areas of Central Oregon. These fields became troublesome after potatoes were grown in the rotation. Did the potato seed introduce the nematode into this area that was likely free from this pest when the desert was first watered for farming?

In Indiana and other mid-western states a lot of tomato seedlings are imported from the southern states, where nematodes are known to be most numerous. Are we introducing new nematode pests into these soils by this system? If so, corrections can be found by sterilizing the southern seed beds.

On the Wm. Gehring Farms on muck soils near Medaryville, Indiana, Dr. R. E. Lucas found that nematodes were responsible for a total failure in onions. A sterilization of the soil with a newly developed fumigant has made possible big onion yields again.

In California many growers of specialized salad crops have found nematodes so bad that soil sterilization has been profitable.

Crop rotations appear to be helpful in controlling nematodes. A healthy vigorous population of anti-biotic soil micro-organisms from actively decomposing organic matter may be the magic of organic matter so little understood.

The limited literature on nematodes shows cases where nematodes are responsible for other plant diseases. The root injury from the nematodes opens the plant to attacks by other pathogens to produce various diseases.

If nematodes may be the primary causes of many major troubles in growing plants, let's urge that more research be done to find the facts.

Phosphorus for Good Yields

Condensed from The Ohio Farmer

Earl W. McMunn

It's a far cry from a corn field to the plant and animal life which existed in this country in prehistoric ages. And yet, the phosphate you'll buy for corn this spring once existed as a living organism of some kind. It may have been no more than a single-celled animal. On the other hand, some of that phosphate may have come from the mineralized remains of a giant prehistoric shark or mastodon.

America is fortunate in having nearly a third of the world's known deposits of this valuable plant food. Continued cropping soon depletes the supply of available phosphate in the soil. If yields are to be kept at a high level, this material must be replenished in the form of commercial fertilizer.

Phosphate rock deposits are not found everywhere in the country. Main sources of supply are some of the Rocky Mountain states, Florida and Tennessee. Our present supply for commercial fertilizer is now coming mostly from these two states.

An area near Tampa in Central Florida is the very heart of the world's phosphate production. In that area are located almost half of all the phosphate mines in the United States. Last year these mines produced about seven million tons of phosphate rock. An average month's production would take almost 12,000 box cars to move the fertilizer from the mines to consumers.

It's a big business, mining and processing this phosphate. Big tonnages are involved. This means big machinery to mine and process this phosphate rock and to make it into the superphosphate which means bigger yields of corn, wheat and grass.

These Florida fertilizer mines are no more than pits in the ground from which the phosphate-bearing material is dug. But what pits! Giant power shovels bite into the pit, taking 18 or more tons at a single gulp.

The phosphate rock in that area is hardly rock at all. It is little more than pebble size and is mixed with sand, clay or soil. The giant dragline shovels which may move as much as 35,000 or 40,000 tons per day dip up the mixture containing the phosphate rock and drop it near the entrance of a pipe line. There it is washed into

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Cleveland, Ohio, December 2, 1950

the pipeline with a high-pressure stream of water.

Mammoth pumps carry the mixture of rock and water to refining plants. There, in giant washers the phosphate rock is removed from the sand and dirt. The wet phosphate rock is dumped into cars and taken to drying plants. Here, in huge revolving drums the wet rock is dried by a blast of hot air supplied by an oil burner.

The wet phosphate rock must be dried, but that doesn't complete the process of producing superphosphate. It was discovered a long time ago that the raw phosphate rock releases phosphates to growing plants very slowly. It was also discovered that treating the raw rock with an acid speeds-up the release of phosphates.

Ordinary superphosphate is the result of treating ground phosphate rock with sulfuric acid. This results in the superphosphate we get in the bag today. It contains 18 to 20 per cent phosphoric acid. A 45 to 47 per cent triple superphosphate is made by treating ground phosphate rock with phosphoric acid.

Large quantities of sulfuric acid are needed to treat the raw phosphate rock. This acid is made from sulphur. Ability of fertilizer manufacturers to get enough sulphur may be a big factor in deciding just how much superphosphate can be made for the coming season. Sulphur supplies are short and likely to remain so.

Even though our major supply of phosphate for fertilizer comes in the form of superphosphate and triple superphosphate, there are other sources. They include ammonium phosphate, liquid phosphoric acid and calcium metaphosphate. But, whatever the source, one fact stands out—our increased use of phosphate materials is a big factor in our recent gains in crop production.

Feeding The Young Pig

Condensed from The American Hampshire Herdsman

M. E. Ensminger
Dept. of Animal Husbandry, Washington State College

SMALL pig losses and runty pigs constitute one of the major threats to profitable pork production.

It is essential that suckling pigs receive a generous supply of milk, for at no other stage in life will they make such economical gains. The gains made by pigs from birth to weaning are largely determined by the milk production of the sows—and this in turn is dependent upon the ration fed and the inherent ability to produce milk.

The protein requirements of the pig, both in quantity and quality, are greatest early in life. Accordingly, for most economical results, the ration of the pig should be changed at different stages of growth. The recommended protein levels for different weight groups are as follows:

Range in weight of pigs	Protein content of ration (per cent)
Weaning to 75 pounds	20
75 to 125 pounds	16
125 to 200 pounds	14
Gestating or lactating sows	15 to 16

If the pigs are being self-fed, the protein supplements may be provided free choice. Fortunately, pigs show a remarkable ability to balance their own rations when allowed to choose from several feeds cafeteria style. The protein supplements may either be combined as a mixture, or each type of ingredient may be fed in a separate compartment. An exception should be made to this method of providing the protein supplement when the grain ration consists of barley, oats, rye, or kafir. When fed these grains, pigs usually consume more of this protein supplement than necessary, thus reducing the economy of the ration.

Of all common farm animals, the pig is most likely to suffer from mineral deficiencies, especially calcium. Also salt may be deficient in many swine rations.

A deficiency of calcium or phosphorus (or a lack of vitamin D) retards normal skeletal development and gain in live weight. The bones become fragile and are easily broken, and depraved appetites may be observed. In brood sows, a pronounced lack of these minerals may prevent normal reproduction, and the young may be born weak or even dead. If the deficiency persists with pigs, rickets will develop. This nutri-

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tional disease is characterized by a stiffness of the legs and a general unthriftiness; and it may even result in a paralysis of the hind legs. Feeding steamed bone meal, which furnishes both calcium and phosphorus, is a common supplement when these two minerals are needed for swine. When proteins of plant origin are fed, a compartment containing ground limestone or oyster shell flour may well be added.

Although swine require less salt than other classes of farm animals, it is generally advantageous to supply them with it, particularly if the protein supplement is not derived from tankage or fish meal (two feeds which supply salt). A lack of salt is marked by poor appetite, unthrifty condition, and failure to grow. Salt may either be added to the ration at the rate of ½ pound per 100 pounds of feed; or it may be provided in a suitable box or trough to which the animals are allowed free access. In iodine-deficient areas, stabilized iodized salt should be used.

If suckling pigs are confined to paved pens or lots with no access to soil or forage (a common condition with pigs farrowed in the late winter or early spring months), serious losses from anemia (lack of hemoglobin in red blood cells) are likely to be encountered. The anemia is due to a deficiency of iron and copper in the milk.

Nutritional anemia in swine, commonly called "thumps," is characterized by labored breathing, a swollen condition around the head and shoulders, and a general weakened condition. This deficiency disease may be prevented by giving the pigs access to a little uncontaminated soil or sod, free from worm infestation. In addition, the pigs should be encouraged to eat a grain ration as soon as they are old enough.

A common anemia preventive measure or treatment for affected pigs consists of swabbing the udder of the sow with an iron sulfate solution (prepared by dissolving a pound of copperas in a gallon of warm water). This solution should be applied daily and may be put on the udder with a clean paint brush or a cloth swab. The iron solution contains enough copper as an impurity to supply the pigs' need for it.

The vitamin requirements are especially important in pigs from birth to 75 pounds. The pig has need for vitamins A and D, the B vitamins (especially riboflavin, niacin, choline, and pantothenic acid), and some elusive unknown factor or factors contained in green pastures; well-cured, green, leafy alfalfa hay; distillers' solubles; fish meal; and liver.

Fortunately, experiments indicate that the maximum year-around use of either green pas-

tures or well-cured, green leafy alfalfa hay will eliminate most, if not all, of the vitamin deficiencies (including any need for unidentified factors) of swine under practical farm conditions. This means that the crop rotation should be designed to provide for a long pasture season, and ground alfalfa of superior quality should be available the rest of the year. When pastures are not available, the ration of young pigs should contain 5 to 10 per cent ground alfalfa. Lush pasture grasses and bright green alfalfa hay are unexcelled as sources of carotene (provitamin A) for swine. Likewise, the exposure of the ergosterol of grasses or hay to direct sunlight causes it to serve as an excellent precursor of vitamin D. When pigs graze pasture, the direct exposure of the animal to the sunlight also results in the formation of vitamin D from the cholesterol of the skin. Green grasses and hays are also excellent sources of the B vitamins and the unknown factor or factors.

When neither pastures nor alfalfa are available, the essential B vitamins for the pig may be provided by adding to the ration 2 to 4 per cent of yeast, distillers' dried grains with solubles, distillers dried solubles, or other fermentation by-products. The only limiting factor in the use of these concentrates is their high price. Fish meal and good quality tankage are also satisfactory sources of most of these vitamins, but even they do not excel green pastures or high quality alfalfa hay.

Nutritionists generally look upon alfalfa as holding a place in animal nutrition comparable to that which milk popularly holds in human nutrition. Alfalfa contains proteins of the right quality to balance out the amino-acid deficiencies of grain proteins; it is a rich source of minerals, especially calcium; and, finally, it is an excellent source of most, if not all, of the vitamins needed by the pig. In addition to its beneficial effects in supplying the needed vitamins, minerals, and proteins, the inclusion of alfalfa in swine rations generally reduces the feed cost, for alfalfa seldom costs as much per pound as the grains. Thus, under dry-lot conditions, it is generally recommended that the ration of young pigs contain 5 to 10 per cent and gestating-lactating sows 15 to 35 per cent of ground alfalfa made from well-cured, green, leafy hay.

At the moment, the most discussed new development in swine rations is the new vitamin B_{12} and the "animal protein factor" (APF). In swine feeding, it has long been recognized that proteins of animal origin (skim milk, fish meal, tankage, etc.) have a higher feeding value than those of vegetable origin (soybean meal, lin-

seed meal, peanut oil meal, cottonseed meal, etc.). For economic reasons, however, a considerable proportion of vegetable proteins are usually fed. Some of the higher feeding value of the animal proteins can be attributed to: (1) their better quality proteins in terms of amino acids, and (2) their improved mineral content; but, until recently, the elusive reason for their superiority was generally referred to as the presence of the unknown factor or factors. Current research indicates that this elusive factor or factors is B_{12} and probably other components of the APF. Progressive feed manufacturers and swine producers are looking forward with interest to lowered costs for these products and the unravelling of the story of their place in swine rations.

Since feed accounts for nearly 80 per cent of the cost of producing pork, the good feeder can insure greatest pig profits by taking advantage of new developments in swine nutrition.

Paved Barnyards

Condensed from The Michigan Farmer

J. S. Boyd
Michigan State College

We are all familiar with the ease of construction, durability and cleanliness of the concrete floor in our dairy barns. The ease of feeding, handling milk, and cleaning are all factors which have made concrete so acceptable for barn floors.

Unfortunately, it seems that too many dairymen fail to recognize that their cows are forced to walk out of this fine, clean barn floor surface into a yard covered with 8 to 12 inches of mud. It is like trying to keep a car clean while driving it without fenders. Cows spend a great deal of time in the barnyard, and more time is probably spent there during unfavorable than during favorable weather. Cows must pass over the lot at least twice each day when they are being turned out, and each time they enter the barn during wet weather they will bring much of this dirt in with them. We all have seen cows wade laboriously through mud, their udders dragging on their way to the barn. This certainly increases

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greatly both the work involved in cleaning the cows and cleaning the barn. A concreted yard which can easily be kept both dry and clean will certainly eliminate much of the work involved in clean milk production.

Any farmer who has hopped around his muddy barnlot, jumping from one solid looking spot to another (only to have some of them sink to shoe top depths) can see the advantages of a paved barnlot from a personal standpoint. When he adds the advantages to his livestock to his own labor efficiency, he will recognize the economic value of a paved barnyard. For instance—how much is your best cow worth? How much would she bring at the yards? Perhaps a paved barnyard will save you the difference in these 2 figures by preventing an injury, foot rot or an infection of mastitis.

The pavement provides a clean, firm surface so that you can haul manure away, or bring feed up to the door at any time. Paved lots are especially appreciated during periods of prolonged rainfall as in the fall, late winter or early spring when the frost comes out and yards seem to be bottomless. Paved yards can be kept sanitary, which means healthier, more thrifty animals. They can also prevent the undermining of foundations caused by water dripping from eaves, and eliminate soil erosion which is particularly serious on sloping yards.

Manure handling has been made easier by making use of a small garden tractor with a snow plow in front of it or some other means to push it into windrows, where it can be picked up with a loader. Manure can be saved on concrete yards, while many tons of manure are tramped into mud and leached away on our barnyards which are not surfaced. This manure would go a long way in increasing soil fertility.

The concrete yard will also mean a saving in bedding. Clean cows, coming from a clean yard, are bound to need and use less bedding. While saving bedding may not be a big factor, we have all been in many barns where a lack of bedding has been the excuse offered by the owner for lack of cleanliness.

Concreted yards will save feed in the case of feeder cattle and hogs. Stockmen have long known the saving in feed where beef cattle and hogs could be fed and yarded on concrete, and certainly the "battle of the mud," which we so often witness in barn yards, does not make for the most effective use of feed by dairy cows. Tests at the University of Illinois show that a concrete paved feeding lot is worth $7 a year for each head of cattle fed on it. That is a very generous return and many farmers say that, if for no other

reason than keeping out of the mud while doing chores, they feel feeding floors and paved lots are worth while.

Then, too, clean concrete yards will greatly reduce the fly menace around the barn. We know that flies breed and develop in filth, and the unsurfaced barnyard has been one of their favorite haunts. Fly free barns may be possible, but not as long as we encourage the development of flies by providing breeding places for them.

When it comes time to build a paved barnyard the following are important points to consider: (1) Location and relation to other buildings. (2) Size and exposure. (3) Drainage. (4) Adequate fences. (5) Manure accommodations.

The location of the cow yard will depend somewhat on building arrangement. However, the ideal location for a yard is one with a south and east exposure. It should be planned so that the approach to the barn will not be through the barnyard, which would necessitate opening and closing of gates. Prevailing winds should also be taken into consideration. In instances where it is necessary to have other exposures, a shelter shed or windbreak fence will often improve the conditions. Whenever possible, silos should be placed in the service yard as it is more convenient when filling.

Since the cost of improving the yard will depend very much on the size, it is well to do some careful planning. Yards having about 60 to 75 square feet per cow have proven satisfactory. However, this does not mean that the entire area needs to be hard surfaced. Many times, it is practical to hard surface part of the cow yard each year.

In finding the right size of feeding floor area to use for hogs, it is well to keep in mind that 10 to 15 square feet of concrete will accommodate each hog to market weight. Usually 30 to 40 square feet of paved area is allowed for each beef animal.

In laying out any hard surfaced yard, natural drainage, soil conditions, and the relation of yard level to the barn floor line should be considered. When natural grading will permit, a yard 6 to 8 inches below the dairy barn floor level is desirable. However, if the yard is eroded and a lower level necessary, a rather flat ramp connected to the barn will avoid extreme filling or grading. Where surface drainage is a problem, grading may be necessary to divert water around the yard, and a curb or toe wall may be necessary to avoid undermining.

Sandy soil will require no subsurface drainage. However, the surface needs to be carefully graded to the proper slope and all loose manure or dirt removed. In tight or clay soils, or where ground

drainage is poor, there should be a 6 to 8 inch fill of crushed rock or gravel.

When concrete is used for yard surfacing, it should be not less than 4 inches thick. If subjected to heavy loads, it should be increased to 6 inches. All concrete should be sloped at least one inch in 10 feet away from the building.

A recommended mix for yard paving is a 1: 2¼: 3 mix; in other words, one sack of cement, 2¼ cubic feet of sand or fine aggregate, and 3 cubic feet of gravel or crushed rock not more than 1½ inches in diameter. The quality of the concrete depends on the amount of water used—which should be about 6 gallons per sack of cement.

The concrete should be mixed preferably by mixer for one to 2 minutes. It should be emphasized that too much water in the mix, followed by too rapid drying, is the most frequent cause for poor quality concrete.

The area to be paved must be dry and well drained. The puddled top soil should be removed over the entire area to be surfaced to a depth that will uncover undisturbed soil. Then the area is back filled with 6 to 8 inches of gravel or cinders and thoroughly tamped to provide a firm base for the concrete surface. No fill is necessary if the lot is on well drained soil.

Paved yards are not expensive to build, and they will last a long time with practically no maintenance. Materials for construction of a 4-inch thick floor will cost from $10 to $12 for a 10-foot-square section. This means that the cost will average $5 per cow. Most of the necessary materials are readily available and lots can be paved with ordinary farm labor, although some farmers prefer to hire a contractor. Then, too, some ready-mixed dealers now solicit farm trade, and it is possible for them to haul ready-mixed concrete as far as 25 miles if necessary. The concrete is usually laid in 10-foot sections. Additional sections of concrete can be placed later as time, labor, and money are available. In order to spread the cost over a period of time 10-foot sections can be poured and added to when time, labor and money are available.

Barnyards have also been surfaced with finely crushed limestone, which has been wet down and compacted. Where limestone is used, it should have a thickness of 4 to 5 or possibly 6 inches.

In the emphasis of milk production for quality products, it seems that the hard surfaced yard has been overlooked. It should be one of the improvements to go along with the concrete floors and platforms, milk house, cooling tank, milk handling equipment, and other improvements made to provide clean sanitary housing for the dairy herd.

Tall Fescue

Condensed from Better Crops With Plant Food

R. Y. Bailey

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TALL fescue has excited more interest than any other grass or legume introduced into the Southeast in recent years. It has been planted on almost a million acres in the nine Southeastern States. A roundup of some of the things we have learned about tall fescue on farms appears to be desirable.

Two varieties—Kentucky 31 and Alta—have been the two most extensively planted in the Southeast. These varieties are so similar in appearance and growth habits that the average layman cannot tell them apart. It remains to be seen whether either will ever show any marked superiority over the other under the climatic conditions in this part of the country.

Soil Conservation Service workers who help farmers in soil conservation districts with the preparation of farm soil and water conservation plans are ever on the lookout for plants that will be useful in this kind of planning. They are attracted to tall fescue because of its strong root system and the heavy sod it makes. They also like this grass because it will grow on a variety of soils, ranging from wet lowlands to steep uplands. Fescue makes a sod that is dense enough to support animals on wet land where they would mire on lighter sods.

Fescue makes effective ground cover on uplands and has shown much promise as a grass for use in soil-conserving rotations on sloping cropland. Good stands of fescue and ladino clover have come in several places where the seed was sown and covered lightly immediately after fall-sown small grain was planted. The sod that developed after small grain was harvested in the late spring completely protected the land from erosion during the following winter. This sod would have furnished good winter pasture for livestock.

Results of several such seedings indicate that we can use tall fescue in rotations as short as three years and get about a year and a half of pasture from the grass. Grazing that could be taken from such rotations would reduce very greatly the amount of stored roughage needed for wintering cattle. The sod may be managed in such a way that almost any desired amount of plant material

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can be returned to the land. This stemmy grass with its coarse roots decays slowly. This slow-decaying material should greatly reduce erosion losses during the summer while the land is under cultivation for a row crop.

Tall fescue has been used in a number of drainageways into which water from terraces was emptied. It has given excellent protection against erosion. It also has been used along roadsides, and on several other erosion-control jobs.

Fescue is a better-than-average seed producer, and the seed is rather easy to harvest. This is an important factor in any new grass that is to be planted on very extensive acreages. As an example of the rate at which seed can be produced, the Soil Conservation Service bought 70 pounds of seed in the fall of 1940 and planted it at their Chapel Hill, N. C., nursery the next spring. A small amount of seed was harvested in 1943 and the acreage for seed production was increased there and at other Service nurseries. Seed distributed to soil conservation districts from Soil Conservation Service nurseries since 1943 has totaled 126,000 pounds. This seed was distributed to almost 700 counties in the nine Southeastern States for 5-acre observational plantings.

Fescue has produced best stands on well-prepared seedbeds, has grown more vigorously the first year when planted early in September in the Upper and Middle South and about October 1 in the Lower South. Near the coast, about November 1 appears to be the best date of seeding. This grass has grown most vigorously when well supplied with nitrogen, either from direct applications or from legumes in association with it. Close grazing and heavy trampling during the first winter have retarded root development and weakened the stands of this grass.

After it has been proved that fescue will grow on a wide variety of soils, that it remains green enough for grazing whenever it has adequate moisture, and that it makes a heavy sod that holds animals up on poorly drained soils, several questions about its value as a forage plant need to be answered. Is it palatable? Is it nutritious? Will it grow satisfactorily in mixtures with legumes? Is it susceptible to disease? How long will a stand last under grazing? We have partial answers to all of these questions, but tall fescue is too new to most of the Southeast for anyone to know the final answers.

The question about palatability usually brings answers that are based on the conditions under which the grass was grazed. Stock have readily eaten green, succulent fescue that was grown in mixtres with legumes such as ladino or white clover. On the other

hand, stock have not grazed coarse fescue that was left after seed was harvested, if they could get other feed that was more succulent.

We called on farmers in each of the nine Southeastern States for reports of their experience in pasturing fescue. Reports were received from 208 different farmers who pastured stock on a total of about 3,200 acres of it. This included 150 who had pastured beef cattle, 63 with dairy cows, 13 who pastured sheep and milk goats, and 13 who had pastured hogs. In most cases, the fescue was in mixtures with one of the white clovers or some other legume. In other cases, the grass was grown in pure stands for seed production, but was mowed after seed harvest and stock were turned on it after succulent new growth was produced. The grass was green and succulent in practically all cases. Pure stands were fertilized with nitrogen.

We had only one unfavorable report on palatibility. This was on a farm where a small patch of fescue was protected from grazing until summer after seed was ripe. Cattle that were turned on the coarse, tough grass refused it. This was exactly what should have been expected with fescue or most any other perennial grass. A good many of the farmers said their stock ate fescue in preference to other pasture grasses. On one Virginia farm, cattle grazed smooth brome grass in preference to fescue, but grazed fescue in preference to several other pasture grasses commonly used in that section of the State.

The question of palatability may be summed up as being one of management. When fescue has been grown with legumes that made vigorous growth, or where the grass was fertilized with nitrogen to make it green and succulent, stock have grazed it as well as they have other pasture grasses. Where fescue in pure stands has been left ungrazed until the leaves were coarse and fibrous, stock usually have not grazed it readily.

The nutritive value of fescue is not well known. Several state agricultural experiment stations are making studies, but very little has been published on the subject. Again going to farmers for their experience, we found that where fescue was grown in mixtures with legumes, or was well fertilized with nitrogen, stock made good gains on it.

Henry Vann of Clinton, N. C., pastured beef cattle for a period of 11 months on 45 acres of fescue and ladino clover. He reported that his grass and clover carried one and a half animal units per acre during this period and that the beef yield per acre was 450 pounds. Mr. Vann planted 85 more acres to fescue and ladino clover.

J. Harris Smith, Route 1, Jackson, Tenn., pastured 50 sheep on five acres of fescue from the time seed was harvested in June 1948 until the next February. He also pastured sheep again after the 1949 seed crop was harvested. The sheep grazed fescue very closely and were in good condition when they were taken off in the spring for the grass to make seed.

What about dairy cows? They are more delicate than beef cattle and are more sensitive to the quality of feed. Dairy cows might not produce a normal amount of milk on this coarse grass. Joe Strickland of Pheba, Miss., gives the following interesting report of his experience with dairy cows on fescue and white clover pasture: "I half-heartedly planted 10 acres of my worst land to fescue and white clover. It is now the best pasture on my place. I put nine cows on this grass and clover on December 10. On March 20, I took them off so I could save seed, but in three days milk production had dropped five gallons a day, so I put them back. I took the cows off again in April and the same thing happened, so I decided it would be cheaper to let the cows eat the grass and then sell the milk and buy fescue seed. I am sold on this grass for I have seen what it does."

Mr. Strickland limed the land and applied a liberal amount of phosphate before the grass and clover were seeded. He topdressed with 300 pounds of complete fertilizer when the plants were up. He applied 200 pounds of muriate of potash on one acre. He says his cows grazed more on that acre than on any other part of the field. These results convinced him that he must apply potash along with lime and phosphate if he is to maintain a good stand of clover that can furnish nitrogen for his fescue.

E. B. Mack, a dairy farmer of North, S. C., pastured 71 dairy cows on fescue during September and October 1949. This fescue was on Norfolk and Ruston sandy loam and loamy sand. Most of the acreage of fescue was seeded with ladino clover, but part of it was in a mixture with crimson clover. Lime and liberal amounts of fertilizer were applied to stimulate vigorous growth. Mr. Mack said, "My cows pick up in milk production when I put them on fescue and drop off when I take them off fescue."

Other dairy farmers have reported increases of from 15 to 40 per cent in milk production when cows were moved from other pastures to fescue. These have included herds of from a few cows to large herds. They have included high-producing cows on test. Without exception, these fescue pastures were well fertilized. There is a probability that in some cases differences between

fertilizer treatment of fescue and other pastures accounted to some extent for the better results when cows were on fescue and clover pastures. In almost every case that has been reported, farmers who have pastured fescue have increased their acreage substantially.

Tall fescue has been grown in mixtures with a wide variety of legumes. Ladino clover has grown very well with this grass. A few management principles that have proved to be important in keeping these two plants in a mixture are: Selection of land on which ladino is well adapted; adequate liming and fertilizing to maintain a vigorous stand of ladino; and a rate of grazing that keeps the two plants from competing unduly with each other.

The rate of seeding of each plant appears to be rather important. Very heavy rates of grass seeding sometimes result in overcrowding and a thin stand of clover. Excessive rates of seeding clover frequently result in thin stands of fescue. Our experience on a large number of farms has shown that under average conditions 10 pounds of fescue and 2 pounds of ladino clover seed per acre give plenty of plants for a good sod by the time the plants are a year old. Good stands have resulted where 6 to 8 pounds of fescue and 1 pound of ladino seed were planted with a cultipacker seeder on a well-prepared, firm seedbed.

Farmers who have had good results with extremely heavy rates of seeding crimson clover, ryegrass, and small grain for winter pasture have sometimes been inclined to use too much seed of fescue and either ladino or other white clovers. The perennial plants grow off somewhat more slowly than the annuals the first few months. This has led to the idea that stands from normal rates of seedings of the perennial mixture were too thin. Those who have used very heavy rates of seeding to get stands that were comparable to their annual mixtures are likely to have trouble keeping the sod in balance after the first year. Both fescue and ladino plants spread considerably after the first year. The normal development of these plants will force a good deal of natural thinning. This thinning may sometimes be at the expense of either the clover or the grass, rather than being a uniform thinning of both. The final result may be an unbalanced sod.

Regular applications of lime and fertilizer to keep clover and other legumes that are grown in mixtures with fescue in strong, vigorous condition are absolute essentials. In a great many cases, legumes have starved out of the mixture, and fescue has been said to have crowded the legumes out. Tall fescue and reseeding crimson clover were seeded together on poor, cherty upland near Dalton,

Ga., in the fall of 1947. In checking the volunteer stand of clover in December of 1949, it was observed to be patchy. A natural assumption was that the fescue was crowding the clover out, but on closer examination it was found that the thick patches of clover were where the fescue was most vigorous. This indicated that the greater fertility in these patches was an important factor in keeping the clover in the mixture.

Grazing has appeared to be an important factor in maintaining a balance between fescue and ladino or other legumes. At seasons when either plant tended to dominate, grazing appeared to reduce competition and helped to keep the sod in balance. Examples have been observed where annual lespedeza in mixtures with fescue was not grazed during the summer. The lespedeza grew so vigorously that it overtopped the fescue in mid-summer and reduced the vigor of the grass stand. In a few cases, grass stands were severely thinned by this competition.

Fescue has been seeded on a good many old stands of sericea and this mixture has looked promising on uplands where shallow-rooted plants usually are severely damaged by summer drought. This mixture appears to be best adapted under pasture conditions where both plants are grazed down so that neither can dominate. Sometimes sericea has been mowed for hay in the summer and the fescue pastured during the winter. Where sericea was left uncut and ungrazed during the entire summer and harvested for seed in the fall, fescue stands were severely thinned during the latter half of the summer. Likewise, where fescue was fertilized heavily with nitrogen in the spring and left for a seed crop, the very heavy grass turf has weakened the stand of sericea.

Wild winter peas (also called Caley or Singletary peas), sweet clover, and several other legumes have shown promise in mixtures with fescue. A principle that has become more evident as we have gained further experience with this new grass has been that legumes to be grown with fescue must be selected on a basis of their adaptation to the soil. In one part of a state, or even a country, soils may be of limestone origin and well-adapted to ladino clover. In another part of the country, soils may be derived from sandstone and either annual or sericea lespedeza may be the best legume for use with fescue.

It is doubtful whether anyone can tell how long a stand of tall fescue is going to last on a particular soil. The very old sod that has been on the Suiter farm in the mountains of eastern Kentucky for 50 or more years would lead to the assumption that a

fescue sod may last almost indefinitely. Under different soil and grazing conditions, a sod may be much less permanent. All that we have seen to date indicates that a sod will last a good many years if fescue is grown with an adapted legume and the soil is treated adequately to maintain the legume in vigorous condition. The rate of grazing also appears to be quite important. A few cases have been observed where good stands of fescue on well-adapted soils were grazed so closely that almost every plant was killed.

Our experience to date has led to the opinion that fescue for winter pasture must be protected from grazing from late summer until winter grazing is to begin. Fescue remains green enough during the cold weather to be eaten readily by livestock, but it makes almost no growth when the temperature is below about 65 degrees. If stock are removed in late summer, grass in a mixture with a good stand of clover, or with an application of nitrogen fertilizer, should have 8–10 inches of leafy growth by the time cold weather begins. Sample areas in a field of fescue and Louisiana white clover were harvested for yield in west Tennessee in the late fall of 1948. The yield in terms of cured hay was a little more than 1½ tons per acre.

We need more information about the use of nitrogen fertilizer where fescue is grown in mixtures with legumes. The white clovers and other legumes supply enough nitrogen to keep the fescue green, but not enough for maximum growth. Further experience must be had before we can tell whether applications of nitrogen will stimulate the grass to such vigorous growth that the legumes will suffer more severe competition.

Those of us who have had an opportunity to study tall fescue in Soil Conservation Service nurseries and on hundreds of farms believe it is a good grass. Farmers believe it is a good grass. They have shown this by expanding their acreage as rapidly as seed was available. Many of them started with five acres or less for observation and have increased their plantings to several hundred acres. Tall fescue is not a "wonder grass" that is going to replace all others. It promises to be very useful in the land-use phase of soil and water conservation planning. It will do several conservation jobs on both grazing land and cropland. We have not had well-adapted, perennial grasses to do these jobs in most parts of the Southeast. Several other kinds of pasture will be needed, in addition to fescue, before we reach the desired goal of year-round green pastures. It is our hope that this progress report may be helpful to others who are studying the tall fescues.

Care of Disposal System

Condensed from the Nebraska Farmer

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Extension Agricultural Engineer

For safe and satisfactory disposal of sewage the septic tank and disposal field, proven by years of service, are generally accepted in most areas. However, the septic tank, like a tractor, requires care and maintenance to insure years of service. Failure to maintain your system may result in trouble and unsatisfactory performance.

The septic tank allows separation of liquid and solid sewage and also provides space for the decomposition of solids. Sludge which collects in the bottom of the septic tank is the result of decomposing solids.

The rate at which sludge collects will depend on the size of tank, number of occupants in the home, and on the type of sewage. When tanks of small capacity are used it is not uncommon to find them filled with sludge in one or two years.

A septic tank should be inspected one year after it has been installed to determine the amount of sludge accumulated. Cleaning will be necessary when 1½ to 2 feet of sludge has accumulated. Most septic tanks require cleaning at intervals of 2 to 4 years.

Sludge can be removed by bailing or by pumping with a sludge or bilge pump. Good results can also be obtained with a pitcher pump. It is not necessary to pump the entire contents of the tank. Only the black mass of sludge which has collected at the bottom of the tank needs to be removed. If the tank has more than one compartment or chamber, each should be cleaned.

Wastes removed from septic tanks may contain many harmful disease germs, such as diphtheria, typhoid fever, dysentery and others. Therefore, it is advisable to dispose of these wastes at least ½ mile away from the premises, preferably in a trench or pit with at least 2 feet of earth cover. Dumping in a road ditch or drainage way can only result in the spread of disease germs.

A septic tank is intended to handle sewage only; however, by increasing the size, coffee grounds and ground garbage can also be included. To insure best results the tank size should be increased 50%. However more frequent cleaning may be necessary.

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Lincoln, Nebraska, December 2, 1950

Judging from reports received, there seems to be a tendency for commercial operators to charge exorbitant prices for cleaning septic tanks. In some cases, charges of $75 to $125 have been made. Such prices for 2 to 4 hours of work might well be termed a racket. It is rather difficult to suggest a fair charge for this service; however, a fee ranging from $20 to $40 would seem reasonable. The fee charged for cleaning would depend on the amount of sludge removed and the labor involved.

When commercial operators are engaged for this service, it would be in order to check on their reliability. Some understanding on charges should also be made.

A word of caution may be in order before inspecting your septic tanks. Do not use matches or an open flame to inspect a tank, as the gases produced by decomposing sewage may explode and cause serious injury.

APF and Antibiotics

Condensed from the Hog Breeder

Damon Catron
Iowa State College

I. What is APF ("Animal Protein Factor")?

It is not a protein. What is now called APF is a product produced by carefully controlled biofermentation. The three nutritional fractions, found in variable amounts, now known to be in different APF concentrates are as follows:

(1) Vitamin B_{12}—known as the "anti-pernicious anemia factor", or the "cow manure factor".

(2) **Primary antibiotic residues in crude form**—resulting from the production of crystalline (pure) aureomycin, streptomycin, penicillin, terramycin, etc.

(3) **Other fermentation residues**—composed of primary antibiotic breakdown products, secondary antibiotics, and/or B-complex vitamins (known and/or unknown).

Each of the above three fractions give an additive growth response in swine feeding.

II. All APF Concentrates are Not Alike. The composition of

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APF concentrates varies with the process used in their production:

(1) Some contain mostly Vitamin B_{12} and little antibiotic or fermentation residues.

(2) Others contain various amounts of the three fractions listed above.

III. How Can the Feeding Value of APF Concentrates be Evaluated?

The best way at the present is by feeding tests. Some APF manufacturers guarantee a Vitamin B_{12} content, but no guarantees are made for either the antibiotic or fermentation residues. Other than this, the reliabiltiy and reputation of the local supplier is the best guide.

IV. Can APF Concentrates and Plant Proteins Replace Common Animal Proteins?

Yes, partially if not entirely. APF concentrates supply Vitamin B_{12} which has previously been the irreplaceable nutrient found in animal protein ingredients, such as meat and bone scraps, tankage, fish meal and condensed fish solubles, but not in plant proteins, such as soybean oil meal.

APF concentrates contain as high as 350 times as much Vitamin B_{12} as is found in meat and bone scraps.

V. Rations Must be Re-balanced when animal proteins are replaced by soybean oil meal and APF.

Animal proteins (such as meat and bone scraps, tankage) contain more calcium, phosphorus, riboflavin, and niacin then soybean oil meal. Therefore, these nutrients must be added to re-balance the ration if animal proteins are to be successfully replaced with soybean oil meal and APF.

VI. Advantages of APF Concentrates:

(1) APF can supply the Vitamin B_{12} heretofore supplied only by animal proteins. This will help extend present supplies of animal protein ingredients. Livestock feeders have never fed enough animal proteins because there has never been enough to go around.

(2) The Vitamin B_{12} content of the APF concentrates can be standardized, whereas natural animal protein ingredients vary in their B_{12} content.

(3) Certain APF concentrates contain antibiotic and fermentation residues (which promote growth and thriftiness) **not** found in animal protein ingredients.

(4) Research has shown that APF concentrates have increased the daily gains of pigs fed in drylot from 13% to 50% over otherwise good rations containing practical levels of meat and bone scraps.

(5) APF concentrates will enable the hog producer to

market his hogs earlier. (In Iowa State College tests, APF finished pigs for market up to 20 days earlier.)

(6) Improved APF concentrates and expanded production will enable us to formulate more economical rations which will give more uniform results.

VII. What is an Antibiotic?

An antibiotic is a chemi-therapeutic agent (drug) produced by carefully controlled bio-fermentation with microorganisms. There are hundreds of antibiotics and each is effective against a different range (kinds) of bacteria. Examples of antibiotics—penicillin, streptomycin, aureomycin, terramycin, etc.

VIII. What Effect do Antibiotics Have in Swine Rations?

Some antibiotics have been found to stimulate growth in pigs over that obtained on good rations and to control certain types of scours. At the present, it is thought that the antibiotics accomplish this by controlling the bacteria in the intestinal tract.

It appears that the value or effectiveness of antibiotics, or antibiotic residues, in swine feeds will vary in relation to the "disease level". (The "disease level" is defined as the degree or amount of feed-lot contamination with bacteria and virus infestation causing scouring in pigs). You will get a **little response** on a low "disease level" but **greater response** on a **high** "disease level". This response may show up in greater growth, feed efficiency, or in less trouble from certain types of scours.

IX. Which Antibiotic is Effective and How Much Should be Fed?

Only two of the antibiotics, auremycin and streptomycin have been tested to date on swine. Both seem effective in stimulating growth at the levels fed. However, research workers anticipate that many antibiotics will be effective in promoting growth and thriftinesss.

Few well established facts are known today about feeding antibiotics. A tremendous amount of research is needed on the hundreds of antibiotics before we know **how much** of **which** antibiotic **should be used** for **what purpose** for each of the various stages of hog production.

X. Can you Buy Antibiotics for Swine Feeding?

Crystalline (pure) antibiotics can be purchased by feeders **only** from drug stores **with** a prescription from a Medical Doctor (M.D.) or Veterinarian D.V.M.). **This method of procurement would cost too much for regular feeding.**

However, certain APF concentrates contain crude antibiotic residues. The purchase of manufactured feeds or APF premixes

(10 to 50 pound packages) containing these APF concentrates is the **only practical** way to date to obtain antibiotics for feeding.

XI. **How Can You Get APF for Swine Feeding?**

Three ways—

(1) Purchase a manufactured feed containing APF.

(2) Purchase an APF Premix (in 10 to 50 pound packages) from a local supplier and mix with protein and minerals. Certain vitamins should be added (especially for drylot feeding) if not contained in the premix. The premix should be **thoroughly mixed** with the other ingredients. Mechanical mixing is preferred.

(3) Purchase an APF concentrate directly from the manufacturer. If this is done, then it will be necessary to re-balance the formula (See Paragraph V) when plant proteins and APF concentrates (straight) are used to replace animal proteins.

Crossbred Cows

Condensed from the Missouri Ruralist

Ed Rupp

Milk production of a commercial dairy herd can be increased rapidly by use of the best dairy bull available regardless of breed. That has been shown rather conclusively by crossbreeding experiments conducted by the Bureau of Dairy Industry, USDA station, at Beltsville, Md.

Proved sires of Holstein, Jersey and Red Dane breeds were crossed with purebred cows of these 3 breeds, also with Guernsey cows to produce 2-breed females. The 2-breed females then were crossed with a proved Holstein, Jersey or Red Dane sire to produce 3-breed females. Now the 3-breed females are being crossed with a proved sire of the breed most remote in their ancestry to produce second-cycle 3-breed families, or 4-breed families where the Guernsey is represented.

Look at production first. Average production of 54 two-breed cows, at an average age of 2 years, 2 months, was 13,006 pounds of milk and 585 pounds of butterfat. That represented an average increase over their straight-bred dams of 2,868 pounds of milk and

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143 pounds of butterfat. Forty-five of the 54 crossbred cows produced more milk than their respective dams, and 51 produced more butterfat.

In the 3-breed families, 41 cows averaged 13,465 pounds of milk and 606 pounds of butterfat at 2 years, 1 month old, which represents an average increase over their 2-breed dams of 367 pounds of milk and a decrease of 1 pound in butterfat yield. In this stage of crossbreeding, 24 of the 41 cows were better than their respective dams in milk yield and 22 were better in butterfat production.

These results indicate that a high level of production may be reached in a comparatively short time, and maintained, by following a crossbreeding program in which good proved sires are used at all times.

As pointed out by Roy C. Jones, Bureau of Dairy Industry Research Center, Beltsville, it took nearly 30 years to obtain a 200-pound increase in the registered herds at Beltsville. In the first generation of crossbreeding, the average increase was 143 pounds. Of course, the production level of the registered straight-bred herd is higher. But crossbreeding does give a quick return which has definite merit.

Herd books are closed. Only way to get into registered cattle is to buy in. If the commercial milk producer has a yen for registered cattle, crossbreeding could offer financial assistance toward getting in sooner.

But what will all this do to registered breeders? As you might expect, the Bureau of Dairy Industry has been criticized for fooling with these crossbreeding experiments. But in the long run it should help the registered breeder. Remember, it takes high-quality bulls in this program as in any other. And there is only one source of supply, the registered breeder.

Only 5 per cent of the dairy animals in the nation are registered. The others are grade cattle. It could improve the demand for high-quality bulls with high-production backgrounds.

Also, artificial-breeding organizations are on the increase and they purchase production-proved sires as rapidly as they become available. The commercial dairyman who is not interested in maintaining a particular breed can improve his position by breeding to the best sire available at the insemination farm.

Thru this experiment at Beltsville a herd of fine-appearing dairy cattle has been developed. There is striking uniformity in size and conformation. Peculiar things can happen in crossbreeding to marking and color. But when similarly marked animals are placed together as we saw them they are desirable in appearance.

Chestnuts Again In Our Time

Condensed from the Pennsylvania Farmer

R. D. Anthony and L. Walter Sherman

THE sudden destruction of the American chestnut trees by blight in the early years of this century was a severe blow to Pennsylvania as well as to many other states.

The native chestnut was one of the most cosmopolitan forest trees and grew well throughout practically the entire state. It supplied a desirable lumber for house construction and the high tannin content of the wood made it an important factor in the large leather tanning industry of the state as well as providing durable fence posts. Harvesting chestnuts supplied many a farm boy with spending money, as there was usually a good market demand.

The chestnut also was a contributor to the social life of the farm home. Roast chestnuts and apples, eaten by the open fire, were standard refreshments when neighbors dropped in for the evening. Grandma knew how to use chestnuts in delicious dishes for festive occasions including chestnuts in the Thanksgiving turkey stuffing.

At the turn of the century, the wildlife of the Commonwealth was just beginning to build up to sizable numbers after unrestricted hunting had brought them nearly to the vanishing point. For the deer, the bear, the turkey and the squirrel, the chestnut was the chief food to put on the fat so necessary to carry them through the winter. Chestnut-fattened pork was considered tops. Acorns and beech nuts have made it possible for wildlife to adjust to the loss of the chestnut, but these are not as nutritious foods nor do they bear as regular crops as the chestnut. The return of the chestnut as a major forest tree will probably bring a considerable increase in the wildlife population.

The hope persists that the American chestnut will develop some resistance to the blight but so far this has not been the case. Sprouts still continue to grow from stumps long since dead but about the time these come into bearing, the blight takes them out. It has been necessary to go to the two Asiatic species—the Chinese and the Japanese—to find trees which can live in the presence of the blight. Even these are not completely immune to the blight, but

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Pittsburgh, Pennsylvania, November 11, 1950

most trees will survive the attack and some show no blight cankers, though blighting native chestnuts may be found within a short distance.

When it was found that these two species could be grown successfully in this country, several agencies began importing chestnuts from both China and Japan. The United States Department of Agriculture sent plant explorers into those countries to find trees of desirable types and to send back nuts from them.

First and second generation seedlings from these Chinese and Japanese importations have been widely distributed throughout Pennsylvania. The State Game Commission imported considerable quantities of nuts and planted over 300,000 seedlings in the various game lands. One sportsmen's association grew and distributed 20,000 seedlings. Private individuals and commercial nurseries were active. More than a hundred years ago a few Japanese seedlings were planted in the State and there are Chinese seedlings now over 50 years of age. Seeds from these also helped spread these Asiatic chestnuts. The big wave of planting was from 1937 through 1940; after that the interest fell off; records of many of these early plantings were lost and it was generally believed these early efforts were failures.

Spurred on by the Pennsylvania Nut Growers Association, the 1949 Legislature authorized the State Department of Agriculture to undertake a two-year study of the noncommercial "tree crops" of the State to determine their value for food and feed. The chestnuts, walnuts, hickories, filberts, Asiatic crab apples, honey locusts and the oaks have received major attention.

One of the first jobs of this survey was locating more than fifty thousand chestnuts surviving from the plantings of ten to twelve years ago and to call attention to the fine performance of many of these in spite of the fact that they were growing under quite unfavorable conditions. The men conducting the survey have also assisted the State Department of Forests and Waters and the Game Commission in securing this fall about forty bushels of chestnuts for planting in the various nurseries maintained by these agencies.

The present plantings show that these new chestnuts are as cosmopolitan as the native trees and nearly as resistant to cold injury. They are growing well from the shore of Lake Erie to the Delaware River. One interesting and successful planting is at an elevation of over 2,400 feet in Somerset county within sight of Negro Mountain, the highest point in the state. Many of the Game Lands plantings are on old abandoned fields with soils of very low fertility,

yet growth and fruiting are satisfactory. These trees cover a very wide range in size and form of tree, size and quality of the nuts, season and amount of yield. In general, they will average as satisfactory or more so than the native chestnut.

The big problem now is how to locate and propagate the best among the many thousands of seedlings. There are at present very few named varieties of chestnuts and none of these has been tested widely enough to know their value in Pennsylvania. Many of the present seedlings seem as good or better than the named varieties. With the Italian chestnut, which is now being sold in our local markets, going out fast in its native home with the same blight which destroyed our own native trees, there is an increasing opportunity for a profitable market for locally grown chestnuts from commercial orchards. The better quality and greater resistance to blight of the Chinese chestnut make this the more promising species.

For wildlife feed the larger Japanese chestnuts are too large to be eaten by grouse and turkeys; also the Japanese species is somewhat more susceptible to blight attack. For these reasons the Chinese chestnut is preferable for wildlife plantings. On the other hand the Japanese trees are more likely to develop forest type trees and are heavier nut producers. The two species intercross readily and many hybrids are to be found in the present plantings. It is possible the future trees may combine some of the good qualities of both species.

Many people are now able to secure some of the nuts from these promising trees and are anxious to grow seedlings. For those who want to plant only a dozen or so it is best to put these in the ground as soon as the chestnuts are secured. If the nuts dry out too much, germination is seriously decreased. Mice, squirrels and chipmunks have an uncanny ability to find these planted nuts, but they can be circumvented.

Plant each nut about one inch deep in well loosened ground. Take a tin can of about number two size from which the top has been cut. With a cold chisel or hatchet make an X cut through the bottom. Place the can, bottom up, over the chestnut, step on it and force it into the ground as far as possible. Next spring leave the can in place but bend back the prongs of the X so the chestnut sprout can grow. Since practically all chestnut trees are self-sterile it is necessary to have several trees planted in the neighborhood in order to provide proper pollinating conditions.

When larger amounts are to be planted, the chestnuts should be stored in cans with tight covers

such as the 50-pound lard can. Punch two nail holes in the can and store it in a cold storage at 32 to 36 degrees temperature. If a cold storage is not available, the chestnuts may be packed in a nail keg or wooden box with damp sand or sawdust and stored in a good potato cellar or spring house. The sand or sawdust will need to be dampened occasionally. There is some danger that in such storage the nuts may sprout before the ground is ready for planting in the spring.

How big will a Chinese or Japanese chestnut grow? Some hundred-year-old Japs in Pennsylvania are as big as mature white oaks. Some fifty-year-old Chinese trees have spreads of forty to fifty feet. Since it will be several years before much but seedlings will be available for planting, these may be spaced 20x20 feet or 25x25 feet. In this way way the less desirable seedlings may be discarded when they have fruited in order to give proper space to the remainder.

The chestnut is a very desirable ornamental tree. In the yard planting, with good care, a tree may begin to fruit in its fourth or fifth year. Permanent grass over the roots may check growth. It is not desirable to push a tree into too vigorous growth which continues late in the season as this makes it liable to winter injury.

In addition to being nut producers, these Asiatic chestnuts promise to be as desirable as the native chestnut tree as a source of tannin and to make long lasting fence posts.

Two Lamb Crops A Year?

Condensed from the Farm Journal

WILL we be able to trick ewes into having two lamb crops a year?

Recent reports from scientific experiments indicate that we might. But the day may still be far off when we'll actually be doing it on farms.

Newest piece of news is that Prof. W. A. Cowan of the University of Massachusetts used hormones on 61 ewes, and got a 108% lamb crop. Then he re-treated 55 of these ewes shortly after they lambed, and got nearly an 80% lamb crop. This has given him two lamb crops within the same year, both of them from hormone-treated ewes.

Less spectacular results were announced by Armour and Company some weeks ago. The Armour sci-

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entists used a hormone on three different lots of 100 ewes that had lambed normally last spring; the best response they got was 51 fall lambs from one lot.

They predicted, on the basis of their tests, that farmers might eventually expect a 65% to 85% fall lamb crop to add to a normal 125% spring crop. At this rate, they said, a flock-owner with 100 ewes might cash in on an extra $1,000 to $1,500 profit a year.

But whether the hormones will work in farm flocks, with the popular farm breeds, and with enough regularity to be worth while, no one knows. Prof. Cowan isn't at all sure that his technique will work everywhere.

Dr. Joseph Meites of Michigan State College points out that "we've had encouraging reports before. Back in the 1930's Dr. H. H. Cole of California used hormones to get lambs out of season. But it wouldn't work consistently."

Several others have got good results for a time. In 1942, Prof. George W. Van Der Noot of the New Jersey College of Agriculture got 65 out of 114 ewes to lamb out of season; but got no results at all the next year. The University of Wisconsin and Cornell University have had the same experience—success one year, failure the next.

Nevertheless, if we do find a way to get the hormones to work consistently on farms, the benefits will be important.

Lambing could be narrowed to days instead of weeks—as ewes would come into heat at about the same time after the hormone was injected. And this might make artificial breeding possible.

With two crops of lambs a year to pick from, you could build up the size of your flock more quickly, and improve the quality faster by culling more closely. You'd also get twice as many lambs from a good ram, and you could select breeding stock more closely for inherited "twinning."

It would put lamb on the market the year round, so that farmers could sell at the lower weights that give the best-sized cuts. If housewives can buy better cuts, the year round, lamb might do better in competition with other farm meats.

It would, in short, help bring back the sheep industry. However, it would work only on farm flocks where you have plenty of winter feed and shelter for the lambs.

It remains to be seen, though, whether the ewes could stand up under two lamb crops a year, whether the out-of-season lambs would do well, and whether market prices would hold up well enough to make it pay.

The gist of the matter seems to be that two lamb crops a year could be a great thing if it would work regularly. But it's too early yet to count on it.

Plant Roots

Condensed from the Fertilizer Review

Robert H. Engle

Too often we are inclined to overlook the importance of roots in the successful conduct of our farming operations. We take it for granted that the roots of plants, will carry on their work below the soil's surface without our assistance.

In the past the above-ground parts of the plant have been given most of our attention. We have been concerned with attacks by insects and diseases, with lack of vigorous growth, and with plant-nutrient deficiency symptoms—all easily observed in top growth. Now roots are sharing our interest. Their functions are numerous. For one thing, they anchor the plant in the soil. The ability of roots to hold the plant upright may affect its crop value. For example, corn which has a limited root system may be uprooted by winds with a poor crop return resulting.

Roots also provide the channels through which plant food and water move from the soil into plants. In general the larger and deeper the root system the greater the amount of plant food and water that can be obtained by growing plants.

Like the top growth of plants, roots have characteristic habits of growth. The type of root system varies with different crops, and even within the same crop.

To make roots work most efficiently, farmers should know these growth habits. Roots are really the mouths of plants but they do not hunt out plant nutrients in the soil as dogs hunt rabbits. Fertilizer must be placed so that the young, tender roots may come into early contact with it soon after they begin to reach out. However, care must be exercised to see that fertilizer is properly applied, neither too close to the roots nor too far away.

If a farmer knows the growth habits of roots he can exercise more care when cultivating. Losses resulting from pruning with cultivators are often exceedingly high. Well conducted experiments with corn by J. T. Spencer, Kentucky Agricultural Experiment Station, showed that root pruning resulted in an 18-per cent reduction in grain weight and a 14-percent reduction in stover weight.

The roots of a single corn plant may have a total length of 5 to 9 miles, according to Ralph M. Wehring, Nebraska Agricultural

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Washington, D. C., Oct-Nov-Dec 1950

Experiment Station. From these facts it is apparent how careless cultivation could easily prune off a total of a half mile or more of such roots, although the disastrous results may not be evident until the corn tassels or even after that. Careless pruning of roots of other crops may have similar results.

An acre of corn with poor roots, according to Mr. Wehring, has a total dry weight per acre of 445 pounds of roots while an acre of corn with a good root system will produce 1420 pounds, almost 1000 pounds more.

Of prime importance is the fact that the roots of deep-rooted legumes penetrate plow-sole compactions or hardpans, opening channels to the subsoil reservoir of plant food. When roots die and decay the resulting organic matter is well distributed in the soil and the channels left by them permit water and air to penetrate the soil.

A concentrated effort to put roots to work rejuvenating poor, run-down soils pays well. There are many crops that will fill the soil with fine, fibrous roots which extend to every part of the plow layer. Meadow fescue and annual rye grass are good examples. If legumes are included in the seed mixture the soil will benefit from the bacteria nodules on legumes. The bacteria can fix atmospheric nitrogen.

Take care of roots. If you do, your cash returns will be substantially increased.

Is It Good Enough for the Bull?

Condensed from the Guernsey Breeders Journal

Paul E. Newman

YOUR bull is supplying 50 per cent of the inheritance of your future herd. He is an important figure on your farm.

If you realize this, you have taken great care in selecting or breeding him. Probably he has cost you quite a sum of money.

"It's good enough for the bull!" How often have you heard or made that statement? Is the weathered hay put over the bull barn on your farm? Do the sweepings from the cows' mangers become the bull's "main course?" Is he kept cooped up in a small pen or tied up in a stanchion? Is he getting the treatment he deserves? Are such measures money-saving or are they gross false economy? It is important to know.

Controlled scientific nutritional

Reprinted by permission from the Guernsey Breeders Journal, Peterborough, New Hampshire, November 15, 1950

studies on mature bulls have been relatively few. Much is still not known, particularly about vitamin requirements.

The requirements for total feed are more easily determined. They are slightly higher for a bull than for a non-milking cow of similar weight. One pound of hay and one half pound of grain daily per hundred pounds of body weight will keep a bull in good flesh. Excessive fatness frequently is accompanied by a poor breeding record. However, contrary to the belief of some people, keeping a bull extremely thin over a long period is likely to prove disadvantageous rather than helpful. The grain feeding should be varied for the individual bull to avoid excessive fatness but to maintain him in a strong, vigorous condition. This may range from four to twelve pounds daily, depending on the individual bull and the quality of roughage fed.

Although studies on vitamin and mineral requirements of the bull are limited, it is evident that a bull's needs for these are not as high as are those for the pregnant cow. For example, several studies indicate that the vitamin A requirement can be met by 4,000 units of carotene (provitamin A) daily per 100 pounds of body weight for growing bulls, probably a slightly lower level for mature bulls. A level of 8,000 units per 100 pounds of body weight would be an entirely safe level in practice. Ten pounds daily of a No. 1 mixed hay would supply this level of carotene for the average size bull. For the dry cow, 15,000 units per 100 pounds of body weight are recommended.

The trouble is that the bull on many farms does not receive nearly as good a ration as the cows do. This is particularly true in terms of Vitamin A. Pasture is one of the best sources of carotene, or provitamin A, for the cows—many bulls never get any pasture or green feed. Well preserved silage is next—heavy feeding of silage to a bull is not commonly recommended and some bulls never get any silage. Good green hay is next in line as a carotene source—many bulls get the "leftovers" from the cows or hay that has been weathered in the field.

A lack of vitamin A in a mature bull results in a falling off in sexual interest, poor semen quality and lowered fertility. In a young, growing bull, production of fertile semen is delayed. If the deficiency is prolonged in a young bull, permanent damage to the germinal epithelium of the testes will occur and the bull may be permanently sterile.

Deficienies of the other vitamins seems less likely to occur in common rations. Vitamin D is necessary for satisfactory skeletal growth and efficient use of calcium and phosphorous. It is particularly

important for growing bulls. Direct exposure of the bull to sunlight, the feeding of sun-cured hay or the use of vitamin D supplemented fitting ration, are all good methods of supplying vitamin D.

The various vitamins of the vitamin B-complex are produced by bacterial action in the bull's rumen and there is no information to indicate that they need cause concern. Cattle can synthesize vitamin C. However, some sterile bulls are found to have low levels of vitamin C in their blood. In some of these cases, vitamin C injections have seemed to be helpful. However, feeding of large amounts of vitamin C has not proved helpful because of its destruction in the digestive tract before it gets into the blood stream.

Vitamin E has long been most controversial. Nutritional experiments indicate that it is very difficult to design a ration low enough in vitamin E to produce a vitamin E deficiency. Yet some dairymen confidently believe that the use of wheat germ oil (high in vitamin E) has improved the breeding efficiency of individuals or an entire herd. It is known that vitamin E aids in the efficient use of vitamin A. When the vitamin A level is below optimum, perhaps this indirect effect of vitamin E may be important to the same extent that higher levels of vitamin A would be.

If the bull has a large enough exercise lot (one half acre or more) so that he can get some good, green pasture, the worry over vitamin A, or carotene, can be pretty well eliminated. When pasture is not available, then either good quality hay or well preserved silage is important. A good fitting ration, fortified with a carotene carrier, can also be helpful. Ordinary concentrates, however, are extremely low in carotene. If the bull is not on pasture a practical recommendation is to use a fitting ration having a vitamin A or carotene carrier in it, plus one feeding daily (10 pounds) of either a good quality green hay or well preserved silage. Corn silage from frosted corn or a silage that has heated in the silo, carries little carotene. Special breeder feeds may also be used. These are effective, but more expensive. Good roughage and a good fitting ration will do the job effectively and economically.

The bull does not have the heavy mineral drain on his system that the milking cow, pregnant cow, or rapidly growing animal has. Good roughages and a good, mineral-supplemented fitting ration will adequately meet his known mineral needs. As an added precaution, a good, complete mineral mixture can be kept before him.

Exercise is important from several standpoints. It helps

strengthen the legs. This is true for both growing bulls and mature bulls. A good set of hind legs is essential for long usefulness of a breeding bull. Exercise also helps keep the bull from getting sluggish so that he will breed more promptly. Equally as important, adequate exercise is extremely helpful in keeping bulls from getting mean or dangerously ugly.

On most farms, the practical answer is a good sized exercise lot or pasture. When given a reasonable opportunity, most bulls will take sufficient exercise. In large bull studs, adequate sized exercise lots are not always possible and mechanical bull exercisers are useful.

The feet of breeding bulls are notoriously neglected. This is even worse with bulls that do not have a large exercise lot, since there is little opportunity then to keep hoofs worn down. Most men do not like to tackle the job of trimming a bull's feet and the feet are allowed to get worse and worse. Long toes put an unnecessarily severe strain on the pasterns and hocks. Many bulls go out of service unnecessarily early because of bad rear pasterns and legs.

The hoofs should be kept trimmed so that the bull always stands well up on his pasterns. In trimming a hoof, merely cutting off the end of the toes is not sufficient. The sole of the hoof must be cut or rasped off to leave the front of the toe down on the ground; otherwise very little of the strain on the pastern and hock is eliminated. Some farms have regular stocks for handling animals that need medical attention or for working on the feet. This is the best setup for handling a bull. Without this, the bull's head should be tied high and securely. A rope tied to the front leg, thrown over the back and brought back under the chest, can be used for lifting the front foot and holding it while working on it. The back leg is more difficult to handle. It can be drawn out to the rear with a rope snubbed around, but not tied to, a post. Some people prefer to throw the bull before working on him. This, however, involves some danger of injuring the bull. When an experienced hoof trimmer or a veterinarian experienced in handling bulls is available, it is usually a good plan to make use of their services for this operation.

The young growing bull should be handled frequently and regularly. This will do much to insure easy and safe handling of him as he grows older. He should be ringed before he is a year old.

The young bull should not be stood for service until 12 months of age and then not more than once a week until 16 months of age. A bull should not be allowed to serve more than two cows in any one day and these as far apart

as possible. It is advisable to restrict the services to four per week and to limit each service to a single copulation. Young bulls are sometimes allowed to run with a group of virgin heifers. This is a sure way of getting most of them safely in calf and also of maintaining both the bull and the young heifers free of disease. Otherwise, a bull should never be allowed to run with the herd. In artificial breeding work, an average of two services per week for younger bulls and a single service per week for older bulls is preferable to more frequent use.

Trucking or shipping bulls any considerable distance frequently results in temporary sterility. In leasing bulls or exchanging bulls for short periods of time, the possible loss of service for a month or longer should be considered. A support for the sac can be made which will eliminate much of the jar on it during trucking. This reduces the chances of temporary sterility occurring. A recently moved bull should not be sold because of sterility until ample time for recovery has been allowed.

Accidents on farms have always been high and we are not making the progress that we should toward decreasing them. The bull is one of the causes of many serious accidents. The real blame, in most instances, however, goes back to the man involved rather than the bull. Bulls should be handled with firmness, but also gently so that they will not become mean. However, it is not the mean bulls that cause most of the accidents. These bulls command the respect that they deserve and the farmer seldom gets hurt by them. The same respect must be given to the gentle bull. No bull can ever be trusted. Every precaution for safety should be taken in handling a gentle bull that would be taken in handling the one that is recognized as dangerous. *Be safe rather than sorry.*

Some bulls, because of poor feeding and care or in spite of good handling, become slow breeders and in varying degrees infertile. Usually their semen has many abnormal sperms present and low sperm motility.

There is no one answer as to the cause or no single recommendation for treatment. Veterinary examination should first of all be made. If no disease conditions appear to be responsible, several measures are worth trying.

First, if the bull is excessively fat, his feed should be reduced and exercise increased to bring him back to average flesh. In the summertime, pasture is frequently helpful, probably through supplying carotene and other nutrient factors and also through the accompanying exercise that goes with a lot large enough for grazing.

The following group of feeding recommendations for troublesome cases is sort of a shotgun treatment. It cannot be expected to work in all cases, but it has seemed to be helpful in some.

I. Feed 200,000 units of vitamin A, supplied either by a carotene carrier or as true vitamin A, daily for one month.

II. Feed one pound daily of an animal protein such as fish meal or dried skim milk or three pounds daily of a calf starter for one month.

III. Give two ounces of wheat germ oil daily.

IV. Give in the feed or by capsule 10 grams of chlorotone (chlorobutanol) daily for five days followed by five grams daily for five days. This increases the vitamin C level of the blood. Overdosage of chlorotone should be avoided since this has an anesthetic effect.

The vitamin A part of this shotgun treatment is probably the most important and would, in some instances, give similar effects if used by itself. If this treatment is effective, the results should be apparent within two weeks and certainly within the month.

Your herd bull does not require fancy quarters or an elaborate feeding program to give you good service. He does need and deserve a good, sound feeding program, comfortable quarters, an opportunity for exercise and kindly treatment. Needless loss of the services of an outstanding bull should not occur on your farm through neglect in his feeding or care. There are few mistakes that could prove more costly to you or be prevented more easily.

Higher Jump Boards, Less Wet Litter

Make your chickens bend over farther when they take a drink, and your litter will stay drier.

So says Harry C. Whelden, assistant extension poultryman at the University of Vermont, who's been experimenting with different heights of jump boards in relation to the height of the water trough itself.

When the jump board is well below the level of the water, and a hen just has to stick out her head to drink, she picks up water on her wattles, and shakes it off.

But when the jump board is even with the level of the water, that doesn't happen. Try it and see if it doesn't work.

—Farm Journal

The Magic of Nitrogen

Condensed from Capper's Farmer

C. J. Chapman
University of Wisconsin

MILLIONS of acres are producing only half a crop. That is because they are shy of nitrogen and organic matter. We've been removing native stores of these two plant needs at a high rate in recent years.

This shortage has come from a mistaken notion that we could maintain nitrogen and organic matter by growing legumes. In Wisconsin this practice has been given a good tryout the last 16 years. Farmers have applied more than 19 million tons of lime, and 2⅔ million tons of fertilizer. For 12 years they have harvested better than a million acres of alfalfa. Clover has also become more abundant and dependable because of widespread soil treatments.

But we haven't raised the organic matter and nitrogen levels in Wisconsin soils by that program. That's true also of other states. The remedy is nitrogen fertilizer.

I still believe fully in lime, phosphate and potash. I'm not talking any less about a long-time program of soil building and crop improvement. But I am talking more about making every acre produce as large a crop as it can within the limits of economy. And that means extra nitrogen. Results from feeding it to crops will be as close to magic as anything we can expect in farming.

One great opportunity for profitable use of nitrogen is on small grain—particularly oats. The danger of lodging and smothering seedlings of clover and alfalfa had always been my chief argument against nitrogen fertilizer on grain. But there is less danger of lodging with the stiff-strawed oats, such as Clinton, Bonda, Benton, Andrew, and Shelby. They will stand up on most soils when yields go up to 90 and 100 bushels.

Another reason we can use nitrogen on a considerable acreage of grain: Millions of tons of lime and hundreds of thousands of tons of phosphate and potash fertilizer poured on farms the last 10 years give clover and alfalfa seedlings a more vigorous start. Once well established, they will stand more competition with the heavier straw resulting from nitrogen fertilizer.

Responses to nitrogen top-dressings on grain and legume seedings in Wisconsin have been spectacu-

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Topeka, Kansas, July, 1950

lar. At the Green County Hospital farm, Clinton oats were fertilized with 500 pounds of 0–20–20 and 100 pounds ammonium nitrate an acre. Yield was 124.6 bushels, but there was no lodging. Clover and alfalfa seedings made a vigorous start. Yield of oats without fertilizer was 80.3 bushels.

In a few cases there has been some lodging, but the problem has never been serious. Certainly I am not recommending nitrogen fertilizer where there is danger of lodging. Likewise, on sandy soil where moisture may be a critical factor, I advise farmers to go easy on the application. But we could profitably use some nitrogen fertilizer on at least half of our 3¼ million acres of grain. The amount is a matter which the individual farmer must determine by his own experience. It has been my observation that more nitrogen fertilizer may be applied on fields that are being seeded to alfalfa than to clover.

For grain on low-fertility soils and where the straw is likely to be short, I suggest a fertilizer mixture containing nitrogen. Or a nitrogen fertilizer may be applied as a top-dressing to supplement basic treatment. Where soils are only moderately short on nitrogen such mixtures as 3–18–9, 4–12–8 or 3–12–12, are suggested at 300 to 500 pounds an acre. Where straw is apt to be very short, supplement the basic treatment of 0–20–10, 0–20–20 or 0–10–20 with 75 to 100 pounds ammonium nitrate, 100 to 150 pounds ammonium sulfate or cyanamid, or 150 to 200 pounds nitrate of soda. In states west of the Mississippi, less potash is required. Such mixtures as the 6–24–0, 10–20–0, 16–20–0, 11–48–0, 13–39–0, or 20–20–0 are commonly recommended. Where these high nitrogen grades are used no supplemental nitrogen is recommended.

Lack of nitrogen was the bottleneck that held down yields on thousands of corn acres last season. This has been true for many years. We had a number of plow-sole demonstrations with complete fertilizer in 1949. These gave some outstanding yield increases. Yet I'm convinced that nitrogen in the 800- to 1,000-pound per acre treatments of 8–8–8 was the element most responsible for the better harvests.

One side-dressing resulted in a big difference. On the Joseph Sharratt farm, Dane county, Wisconsin, nitrogen fertilizer applied July 16 increased corn silage from 15,996 to 25,010 pounds an acre. This increase at $8 a ton amounted to $36. The cost of 45 pounds nitrogen (135 pounds ammonium nitrate) was $5.50.

I still stick to my guns on minerals to back up nitrogen in plow-sole or plow-under treatments on low-fertility land. Most of these "back-40" fields need the phos-

phate and potash contained in an 8–8–8 mixture. But I am more and more convinced that there are thousands and thousands of acres of corn that would respond to straight nitrogen.

Where the general level of fertility has been raised by continued application of lime, phosphate and potash, nitrogen becomes the chief limiting element in maximum corn yields. It is my opinion that within 10 years half of the farmers in Wisconsin commercial corn counties will have equipped their cultivators with side-dressing attachments.

Permanent pastures are usually neglected. Few farmers apply even manure. Native white clovers and other legumes do supply some extra nitrogen, but not enough to make abundant grass growth.

When fertilized with nitrogen, pasture grasses contain 18 to 22 per cent crude protein on a dry matter basis. This early growth is also rich in minerals and vitamins essential to a well-balanced ration. Well-fertilized pasture grass, 3 to 5 inches high, compares favorably in feeding value, on a dry basis, with bran.

Effect of nitrogen on pasture was demonstrated by Wells Himsel, Dane county. His 23-acre pasture was divided. Half was treated with 200 pounds an acre of ammonium nitrate. His herd was alternately grazed on the 2 areas. The fertilized half produced 29,899 pounds of milk during the grazing season; the unfertilized, 16,678 pounds. At $3.25 a hundred the extra milk was worth $429.68. Ammonium nitrate cost was only $48.

Growth of grasses increased by nitrogen fertilization will in time use up the readily available phosphate, potash and lime. It then becomes necessary to use mineral fertilizers. So we recommend liming acid pasture lands at the outset. Apply 300 to 500 pounds an acre of such mixtures as 0–20–10 or 0–20–20 every year. On the more fertile lands nitrogen alone may be used for 4 or 5 years before it becomes necessary to replenish phosphate and potash.

There are thousands of acres of timothy and brome grass that would respond profitably to nitrogen fertilizer. I have carried out hundreds of demonstrations where 175 to 200 pounds ammonium nitrate in early spring produced an extra ton of leafy, palatable feed. And the protein content was higher on the nitrogen treated areas, too!

In northern Wisconsin where farms are small, doubling the yield was equivalent to doubling acreage of hay. That's cheaper than clearing new land and freeing it of stones and stumps. Farmers are producing hay at $6 to $8 a ton, which beats trucking it in at $30. Not only are these men doubling hay yields, they're just

about trebling seed yields. On the Wm. Anger farm, Iron county, Wisconsin, 200 pounds an acre of ammonium nitrate increased timothy hay from 1,650 to 4,125 pounds. Seed yields, however, were increased from 143 to 396 pounds.

The big producers of brome grass seed in Kansas and Nebraska are using thousands of tons of nitrogen fertilizer. That makes heads with fuller panicles, heavier seed of better quality.

And so, on the horizon of potential future crop production looms great opportunity for increasing yields. The magic word is "nitrogen." Nitrogen for more grass, nitrogen for more grain, nitrogen for more corn. But let's also put our long-time crop program on a solid foundation. Make liberal applications of lime, phosphate and potash in longer rotations with more legumes.

Getting the Most from Artificial Insemination

Condensed from Iowa Farm Science

John B. Herrick, Veterinarian
Iowa State College

RESULTS from artificial insemination can be every bit as good as results from natural breeding in your dairy herd. Where all other factors are equal, the conception rate obtained with artificial insemination is equal to that of natural breeding.

Use of semen from superior sires in the process of artificial insemination gives you the advantage of a good sire without the expense and danger of maintaining one of your own. But how much the widespread use of superior sires through the practice of artficial insemination will improve your dairy herd depends on the management practices that accompany it.

Artificial insemination is no miracle method. It's just a handy and economical tool to help you increase production. To be effective, it has to work in connection with other factors which include breeding, feeding, management and disease control.

Keep these points in mind when breeding by A. I.:

Well-cared-for heifers usually mature around the age of 15 to 18 months. Don't breed them before that.

After calving, allow at least 2 heat periods to pass before breeding a cow again.

The *average* cow comes in heat every 21 days. Some cows come in heat as few as 18 days—still

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Ames, Iowa, August 1950

others may take up to 24 days. Each cow usually is consistent. If she comes in heat in 20 days one time, she usually will come in heat every time in 20 days.

The average cow remains in heat about 15 hours. The time ranges from 6 to 36 hours, but 15 is the average. If a cow is first noticed in heat in the morning, she should be bred in the afternoon. If in heat in the afternoon, she should be bred the following morning.

Some cows have "quiet heats" which are hard to recognize. Keeping a record of heats and remembering the fact that each cow comes in heat in a definite cycle will help you recognize these "quiet heats."

The three most important diseases to be on the lookout for when using A. I., as well as when using natural breeding, are brucellosis (Bang's disease), trichomoniasis, and localized infections causing an abnormal discharge. A cow having an abnormal discharge should not be bred. Any persistent trouble should be referred to your veterinarian.

Record keeping may seem like a lot of bother. But it can save you time and money, as well as a lot of trouble.

Some of the things to keep records on are the identification of the cow (number or name), date and length of heat, date of each breeding, time of day when first observed in heat and time of day bred, and the date of calving.

One way records will aid you is by helping to identify "quiet heats." If a cow has been in heat, say, every 22 days, your records will warn you to expect a heat again in 22 days. Therefore you'll keep a closer eye on that particular cow, and can often identify heats you might not notice otherwise.

About 80 percent of cows entertain metrorrhagia (menstruation) after being in heat. Noticing the metrorrhagia will help the farmer record the heat, even if the regular signs of a heat are hard to detect.

One danger to watch for in breeding is the fact that some cows (about 20 percent) come in heat when pregnant. There is a danger of abortion if A. I. is used with a pregnant cow in heat. Owners should have their veterinarian make an early pregnancy diagnosis on their cows to avoid such a danger.

How about the cost of artificial insemination? In Iowa, there's usually an initial membership fee of about $1 per cow in the herd. After that, the cost for each first service is $6, with two more services free if the cow is not settled with the first one.

On that basis a man with 10 dairy cows can breed his cows to the best bulls available for $70 to $75 a year. Compare that with

what it would cost you to raise a herd sire on your farm. A. I. service is available in every county in Iowa.

As to the number of people using A. I., here are some figures: In 1949, 134,188 cows were bred artificially in Iowa. That's roughly 13 percent of the state total. An increase of 10 to 20 percent over last year is expected this year.

Wisconsin, our big dairy state, bred 408,375 cows by A. I. last year. Pennsylvania bred 206,507; New York, 153,973; Minnesota 189,322; and Ohio, 142,472. Iowa, with 134,188, ranked sixth. Throughout the United States there were about 26 million dairy cows of breeding age last year. Over 2 million were bred artificially.

Iowa's total has jumped a long way from the 3,000 cows bred artificially in the state in 1942 when the program was first introduced in Iowa.

Incidentally, some people have the idea that A. I. is some means of getting calves by mixing up compounds in test tubes. It's not. It's simply a technique of taking the semen from the male and depositing it in the female.

The widespread use of artificial insemination indicates that it must be getting good results.

Proper management, feeding, and disease control, together with the correct use of A. I. can mean greater progress in the improvement of our dairy cattle in the future.

Newer Feeding Knowledge

Condensed from The Shorthorn World

Professor G. Bohstedt
University of Wisconsin

With all hardships through shortage of labor and material encountered during and immediately after the war years, the income from livestock farming has nevertheless been satisfactory. During recent months the picture has changed in many respects, thus putting more of a premium on economy of production.

We recognize four essential requirements for successful livestock farming, these being good breeding, feeding, disease control, and management. The latter covers the whole field. No matter how good a feeder or breeder, or how much a stockman knows about disease control, if he does not apply his knowledge, he is not apt to be a success.

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Where all four factors are taken care of reasonably well feed is the most important single factor in the economy of production. Where feed makes up from 50 to 65 or more percent of the cost of producing milk and eggs, feed makes up from 80 to 85 percent of the cost of producing pork and beef, respectively. The rest of the percentages apply to such items as cost of labor, carrying charges, housing, equipment and veterinary costs. So it is seen that, particularly in the case of beef, feed looms large as an item of cost. Therefore proper feeding, meaning the use of suitable feeds that are well fortified, not merely in respect to carbohydrates and fat, or energy, but also proteins, minerals, and vitamins—means more in a program of low-cost production than any other single thing. We appreciate that good field management as well as barn or feed-lot management is required for the best results.

There is now a great deal of interest in newly discovered vitamins and newly appreciated minerals. However, one of the major nutritional problems is still protein. This applies to both quantity and quality of protein, involving, as it does, our most prominent feed crop, which is corn.

Unfortunately during the past 25 years the average analysis for protein of corn has slumped fully 1 percent. Where corn analyzed about 10 percent protein 25 years ago, it now has somewhat less than 9 percent protein, taking No. 2 corn as an example. This loss of 1 percent, sacrificed in the program of greatly increasing the yield of corn to the acre, has significance in that, considering the huge tonnage of corn harvested, this 1 percent drop in protein content of corn is the equivalent to the protein content of the entire soybean crop of the nation that is grown for seed. Surely this emphasizes the very great need for watching the protein content of our newly developed hybrid strains of corn, and corn breeders and geneticists who so far have stressed mostly bushel yield per acre, seem to be duly aware of this need.

Whether applying to swine, poultry, dairy cattle, sheep, horses or beef cattle, the permissible protein allowances, considering available protein feeds, are always far lower than they should be to provide balanced rations as we understand them. Protein is a chronic national deficiency. Obviously the carbohydrates and other nutrients are not utilized efficiently where protein is lacking in the ration. It has been found time and again that the use of a given amount of oil meal or tankage in rations compensates not merely for two or three times their weight of corn or similar grain, but are worth many times their weight in farm grains. We are here consider-

ing their value when using them, as compared with not using them, in rations that depend mostly on low-protein grains and roughages.

Having in mind primarily corn but also other seeds and cereals, there is apt to be a deficiency in some of the amino acids in rations for so-called critical animals, therefore primarily swine and poultry. Some 22 amino acids make up a complete and satisfactory protein such as we have in meat, milk or eggs, or as we have in leafy green forages and to a large extent have in some of the oilmeals, especially soybean oilmeal when properly prepared. Of these 22 amino acids some 10 are designated "essential" amino acids. These the animal cannot elaborate in its own body system from other amino acids, but they must be present in the ration. In respect to essential amino acids, corn is deficient in two of them, tryptophane and lysine.

Probably for this reason young growing pigs in our experiments have responded favorably to mixing wheat or oats with corn, in that way fortifying the amino acid complex for these animals. To be sure, we also improved the corn ration by adding to it the pure amino acids, tryptophane and lysine. But such amino acid feeding is rather expensive and so far is done only for research purposes, not yet in practical feeding. It may be possible some time to use manufactured amino acids if these become cheap enough. It is now known that the amino acid, tryptophane, a protein material, serves as a parent substance in the synthesis of niacin, a vitamin belonging to the vitamin B complex. This vitamin has been identified with the prevention of certain forms of enteritis or digestive disturbances in young pigs. Perhaps for this reason there was an improvement in the growth and thrift of pigs when a corn ration was supplemented by either the amino acid or acids mentioned, or when small grain took the place of corn. While these comments may be a reflection on our principal feed crop, corn, we must realize that to the extent that we know the weaknesses or deficiencies of certain feeds or rations, and then compensate for them by suitable supplementary feeds, we are correspondingly successful in our feeding operations. Corn always has been and will continue to be a splendid feed, but we want to use corn wisely.

To the extent that leafy green forages are fed with corn or other grain, forages like lush pasture or leafy green hay or a corresponding quality of silage, to that extent most, if not all, of the nutritional deficiencies of corn are compensated.

It is really fortunate that annually we have a recurring pasture season when the livestock under

our care has a chance to restore the many nutritional reserves that have been lost out of the system of the animal during the long winter months. Cows after having been turned on pasture, are more apt to settle to services. Young stock that at the end of winter has had to subsist on carotene-depleted roughage and carotene-depleted milk, now has a chance to come out of a condition of nightblindness, or scours, or susceptibility to pneumonia.

We know that carotene, from which vitamin A is produced in the body system, guards against the many deficiency symptoms that affect the eyes, the respiratory organs, the digestive tract, and the reproductive system. There is less ketosis in cattle and other livestock once they are out on pasture again. Perhaps it is the abundance of carotene in combination with the sweetness of grass that helps in the prevention or cure of anemia or ketosis. At any rate, the observations are that there is a great improvement in the health of herds and flocks, once they are out again on lush green pasture.

As much as possible, we should harvest and store or preserve forages at their pasture stage, and not delay the mowing of a hay crop, or the cutting of a corn crop, beyond their prime stage of growth, which is early bloom for legumes, heading-out stage or bloom for grasses, and denting stage for corn.

As compared with pigs and poultry, ruminants like cattle and sheep have an additional nutritional advantage. Not only is a large proportion of their ration made up of forages with all their fine health-protecting nutrients, but these ruminants have the ability by virtue of their paunch or rumen organisms, to make efficient protein out of poor protein, even out of urea or ammonium bicarbonate, which is merely a nitrogen-carrying salt, and is not even protein. So the amino acid deficiency of corn does not concern us in the feeding of cows, steers or calves. Their wonderful anatomy or physiology takes care of them, and guards them against a deficiency of one or the other amino acid. Just so they have enough protein of some sort.

Ruminants also have the ability to manufacture within their paunch a whole array of so-called water soluble vitamins, the B-complex vitamins. Most of us have heard of such vitamins as thiamine, riboflavin, niacin, and even the now famous vitamin B_{12}, which is the animal protein factor, or APF. All these and more besides are being produced in the paunch of a cow or steer by means of the microscopic organisms that are inhabiting that digestive organ. Therefore these bacteria, protozoa, actinomyces, and other

organisms make for wonderful nutritional protection.

Haven't we often wondered why pigs following steers in the feed lot do so well? These pigs are the nutritional beneficiaries of all this rumen activity inside the steer. Poultry research workers have carried their investigations in this respect even further than have swine research men. There is a whole galaxy of good amino acids, healthful vitamins, and even stimulating hormones in cattle manure. The benefits from having pigs follow steers in the feed lot are due not solely to salvaging undigested whole corn that may have escaped mastication of the steer, but along with the whole or shelled corn, to get the benefit of all this biological synthesis that had its beginning in the paunch of the steer. It has been stated at times that the pig with steer manure on his nose is nutritionally blessed.

While pigs and poultry do not have the digestive capacity or digestive ability to handle a lot of forages, whether in the nature of pasture, hay or silage, they nevertheless badly need a certain minimum proportion of their feed intake by way of these leafy green forages. This has been brought out strikingly in some experimental work at the University of Wisconsin and elsewhere, where winter rations for brood sows were made up primarily of corn and soybean oilmeal supplemented with suitable minerals, and furthermore fish liver oil to provide vitamins A and D. Even though a very considerable assortment of synthesized or manufactured vitamins was added to such a ration and also to similar rations for growing pigs, the results by way of thrift and rate of growth were never as good as where a liberal amount of leafy green alfalfa hay was added to the ration. It seems that Mother Nature has put these nutritional principles into a good forage like alfalfa in a way that is difficult to match in the laboratory or the factory. Surely, leafy green vegetation as we have it in pasture, or as we can have it in hay or silage, constitutes a marvellous nutritional protection for all livestock. Indirectly man is the beneficiary of grass, for animals concentrate in their meat or other products, most of the principles in leafy green forages that ultimately improve man's diet.

Cattle are twice blessed in that most of their nutrients are obtained from grass, and that furthermore they have the ability to produce within their own body system, by means of rumen synthesis, the valuable protein and vitamins as single-stomached animals are not able to do. Cattle are thrice blessed in that furthermore they can digest fibrous feeds or cellulose to a degree that single-stomached animals cannot. Hence cattle or other ruminants utilize

more of the ingredients of roughages than do pigs and poultry. We can process through cattle not merely hay and silage but also straw, cornstalks, and even corn cobs. The early Ohio work by Paul Gerlaugh and the more recent work by Roswell Garst of Coon Rapids, Iowa, have focused the attention of the nation upon the surprisingly high feed value of ground corn cobs. Some research nutritionists and stock farm operators have had reservations regarding the place of ground corn cobs, in cattle rations, and two recent experiments, one conducted at Iowa State College with fattening steers, and the other at Purdue University with wintering steers, have given support to these mental reservations.

It was found at Ames that, while ground corn cobs may serve a valuable purpose in steer rations, they should be fed with discretion —not in large amounts for the entire fattening period, especially where choice feeder steers are fed to a relatively high degree of market finish. It was thought that with plainer cattle and especially during the fore part or first half of the fattening period, ground corn cobs may serve a very useful and economical purpose. At such times the cattle have more room in their digestive tract to process corn cobs, as of course they have plenty of room for such fibrous feed fed when they are merely stocked through the winter preparatory to being put on grass the following pasture season. When so used, ground corn cobs may have fully half the value of corn grain. It is necessary to feed liberal amounts of a protein concentrate with a heavy corn cob ration and at least a minimum necessary amount of leafy green hay or similar roughage to protect the cob-fed steers against a carotene deficiency. To put the problem of fattening steers in sharp focus, where ground corn cobs replace considerable corn grain, it is to be stated that the cobs have little more than 2 percent protein whereas corn grain has about 9 percent protein. Corn grain has nearly twice as much total digestible nutrients as the cobs. The real contrast between cobs and corn, however is in reference to fiber. Corn grain has only 2 percent fiber, but corn cobs 32 percent fiber. This woody fiber is the depressing factor in a ration, greatly reducing the energy of the feed and in that way the productive efficiency of the ration.

While corn cobs and straw, and corn stalks or stover have a place in cattle feeding, it is necessary to feed with these low-grade roughages some leafy green hay or silage. We have a long way to go in reference to quality of hay and silage, both corn silage and grass silage.

Mr. George Werner, of the Wisconsin Agricultural Extension

Service, during recent months has kept a box score on hay and various kinds of silages that were brought by farmers to so-called hay and silage clinics at winter meetings. At these clinics he judged these forage samples, placing them in the category of excellent, good, fair, and poor. Having thus passed on 667 samples, his box score was to this effect, using round numbers: Out of the numbers submitted for his judgment only 5 percent could be judged excellent, 25 percent good, 45 percent fair, and the remaining 25 percent poor.

This is a sad commentary on our ability to produce good roughage for winter use. Let us keep in mind that roughages, or forages as some of us prefer to call them, are or should be health-protective feeds. The grains and concentrates are the "power" feeds that, as they are fed in liberal quantities to our cattle and other livestock, figuratively "lay on the whip." We sometimes hear about "burning out" certain animals by too much grain feeding. This frequently means that the protective nutrient reserves of animals, the vitamins and minerals, including trace minerals, especially in the liver and the skeleton, have become exhausted by too much grain feeding. So toward the end of winter we have many deficiency symptoms of the kind previously described. A pasture season then recharges the body system with the many fine nutrients that are found in grass but that are not found to anywhere near the same degree in farm grains, mill feeds, and oilmeals.

The vitamin that is most frequently discussed nowdays is vitamin B_{12}, which contains cobalt in its chemical formula. This vitamin, along with other B-complex vitamins, is present in some feeds, especially animal by-products, and in leafy green forages. Or if not present, cows or steers can synthesize this particular water-soluble vitamin in their paunch provided, of course, the raw materials are present, which therefore include cobalt.

Different areas of the United States and areas in other countries have in recent years been identified as deficient in cobalt. We thus have in this category parts of Wisconsin, Michigan, as well as parts of most of the states along the Atlantic Seaboard, particularly Florida. That the Great Plains or Rocky Mountain states are not necessarily free from cobalt deficiency is suggested by the fact that a cobalt deficiency has been identified in the Province of Alberta, Canada. An iodine deficiency was years ago demonstrated in the Great Lakes area of the United States and Canada, also in some of the Northwest parts of the country. In a number of experiments conducted in various

states, the addition of manganese has proved beneficial not merely in rations for poultry but also for cattle and swine. A copper deficiency of both copper and iron deficiency has been identified in Florida but has been suggested as possibly occurring in other parts of the country where light colored sandy soils are prevalent, or where peat or muck soils derived from sandy subsoil are characteristic of more or less large areas in the particular region.

It is difficult to spot trace mineral deficiencies by way of chemical analyses, for the reason that some of the trace minerals are present, or need to be present, in extremely small amounts, such as 1 part cobalt in 10 million parts of the feed. But if there is only ½ part cobalt in 10 million parts of the feed, the deficiency symptoms occur. Very severe death losses have occurred in flocks of sheep that were cobalt deficient, but the addition of merely 1 ounce of cobalt sulphate mixed with 100 pounds of salt has made for speedy recovery.

For sake of protection, therefore, or cheap insurance, many commercial feed mixtures are fortified with trace minerals, where the manufacturer uses perhaps a trace mineral premix. The average stockman, especially if he depends largely on home-grown feeds, will probably find most convenient the use of so-called "trace mineralized salt" which is becoming increasingly available through feed stores, and which is fed like ordinary salt. Such trace mineralized salt obviously is the kind of salt to use where the trace mineral deficiencies occur. This salt is also cheap insurance in areas where there may be some question as to whether there is, or is not, one or the other trace mineral deficiency. The sound sense of this comes in where trace mineralized salt in most places sells for only four or five dollars more a ton than iodized salt, which all along has been recommended for large areas of the country. On the basis of this difference in cost, and even comparing trace mineralized salt with plain salt, it costs only about ten cents to trace-mineralize a ton of feed mixture. The average stockman would spend only about six to eight dollars a year more, using trace mineralized salt instead of plain salt. If additional phosphorus or both calcium and phosphorus might be needed, a simple arrangement of free choice access to trace mineralized salt in one box and steamed bone meal in an adjoining box, just about takes care of the mineral feeding problem.

Pangola Grass

Condensed from The American Brahman

PANGOLA grass is adapted to a wide variety of soil types and varying weather conditions. It is growing on soils in Florida where soil fertility has been completely depleted and was considered worthless. By the use of fertilizers these soils are now furnishing fine pangola grass pastures. One ranch is planting five thousand acres of pangola grass, and other ranches are rapidly increasing their pangola grass pastures. The farmers and ranchers do not consider pangola a miracle grass, but they say it gives more grazing than any other grass in their area. Many are plowing up old pastures and clearing land to plant pangola grass.

Pangola grass was imported from South Africa in the late thirties and first planted at the Florida experiment station. In 1939 Mr. Walter Bronson, a farmer living near Kissimmee, Florida, was given some of this grass from the experiment station by his county agent. Mr. Bronson planted about one-half acre in 1939. Although enough grass has been taken from this plot to spread over hundreds of acres, the grass is a solid sod, eight to twelve inches thick and waist high. Mr. Bronson has applied a top dressing of fertilizer of about 200 pounds per acre several times since 1939, but otherwise has done nothing to the grass.

Pangola grass belongs to the crab-grass family and has many characteristics of giant crab-grass. When first sprigged, it puts out runners in all directions, which may reach fifteen or twenty feet long. These runners are in joints of four to six inches, and each joint will take root where it touches the ground, if there is sufficient moisture. The grass has been known to completely cover barren ground in 90 days, under favorable conditions. These runners will form a solid mat on the ground, from a few inches to ten or twelve inches thick. It then begins to grow upright and gets to be waist high under favorable conditions. The blades are somewhat wider than crab-grass. It forms a seed head on a long jointed stem, but the seed produced in Florida have failed to germinate, making it necessary to propagate the grass by runners and roots.

Many different methods of sodding are practiced in Florida. About every farmer and rancher has his own method. Norris Cattle Company at Ocala, Florida,

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has developed a machine which will plant 25 to 30 acres per day. This method consists of pulling up the grass with specially designed harrow teeth on a bar in front of a tractor. The grass is then run through an ensilage cutter with some of the blades removed and chopped into 6 to 10-inch pieces. It is blown into a wagon drawn by a tractor where it is taken to the field of well prepared ground for planting. A special designed machine, with two funnels about 4 feet apart, is attached to the rear of the wagon. As the wagon is drawn along, two men feed a continuous stream of chopped grass into the funnels. A disk attachment on the machine covers the grass, after which the ground is packed by a wheel attachment. Another method in wide use is mowing the grass and scattering it on the ground to be covered by a disk harrow. Small plantings were being made by simple hand methods of dropping the runners on prepared land and punching them into the ground with a sharp stick. (Old method of setting out sweet potato plants.) Sodding of this grass is done the same as any plant that does not make seed. The ground must be moist for the runners to take root. Small plantings may be watered until they catch hold. The runners should be cut into 6 to 12 inches and planted several inches deep.

The distance between plants varies in Florida. One acre of root stock of pangola grass can be used to sod 50 to 100 acres the second year, depending upon the fertility of the soil and rainfall to produce an abundant growth.

Pangola grass may be sodded any time of the year; however, sufficient moisture must be present for the plants to take root. A real cold spell or several weeks of drouth before the plants are well rooted would probably kill the plant.

Land on which pangola grass is being planted in Florida is clean and well prepared. In some instances the land is disked or flat broken three or four times before sodding. The ground is soft and mellow. This permits the runners as they branch out to take root, and form a thick covering much quicker. The land is leveled to facilitate mowing, etc., later.

Pangola grass has a fibrous root system and responds quickly to fertilization. On one 50-acre pasture planted last year where one-half was fertilized, the other half not, the difference in growth was noticeable. The plot fertilized had received 200 pounds of balanced fertilizer, in this case 4-12-6. It was knee high with thick sod. The runners not fertilized had not covered the ground. Copper must be added where the soil is deficient in copper, which is the case in Florida. Poor growth caused spotted leaves and plants died

from lack of copper. Pangola grass has a wide PH tolerance, and is said by some in Florida to range from 4 to 8.

Pangola grass responds quickly to fertilizer and water. In this respect it is like most plants. If the soil is poor it will make a poor growth unless fed. A balanced fertilizer of 2 to 4 hundred pounds per acre where the grass is adapted will produce a vigorous growth and furnish abundance of grazing.

Pangola grass responds quickly and favorably to water. It will stand prolonged periods of drouth after established and furnish grazing in Florida quicker after a rain than any other grass growing there. During a period of low rainfall or drouth the growth is slow or stopped. It will stand an abundance of rainfall and has been known to stand weeks and where drained off begin growing. The thick mat formed after the grass is established absorbs large amounts of water and practically prevents "run-off."

In central Florida pangola grass is often killed back by cold and frost during the winter. It is not known just how low the temperature would have to get to completely kill the grass. On the J. D. Hudgins ranch at Hungerford, Texas, about 50 miles southwest of Houston, a small planting of grass withstood a low of 2 degrees above zero in 1949. There was a thick mat of grass at the time. Until the answer to this question is established, large scale plantings are not recommended.

Pangola grass is very palatable; all parts of the plant are eaten. It is preferred in Florida by livestock over other grasses growing there.

When pangola grass is established it will stand heavy grazing. Ranchers in Florida say it will stand more abuse than any grass they have ever seen. During favorable growing weather and with adequate fertilizer, an acre will carry several head of cattle. It can be pastured close and responds quickly when given a short rest period. Cattle cannot pull up the plants when the roots are established. It makes a thick fibrous root system, but is a shallow rooted plant, going to a depth of 6 to 8 inches. Good pasture management, the same as any grass, is required for best results. Pangola grass furnishes more grazing per acre than any other grass growing in Florida.

Pangola grass is not recommended as a hay grass. However, a few farmers in Florida have cut it for hay. A good number of farmers in Florida set aside a pasture for winter use by taking all stock out of the pasture in early fall and letting the grass grow up 5 to 6 feet high. The frost will kill it but every bit of the plant is eaten in late winter when stock need winter feed. This practice is

followed generally instead of making hay.

Due to the thick mat on the ground made by pangola grass, other grasses and legumes have difficulty in surviving. A great deal of research is needed to answer this question; however, general observations indicate that other grasses and clovers will be crowded out by pangola. A separate pasture of pangola should be planned from already established pastures of grasses and clovers. Pangola grass is very hardy and is very aggressive. Under favorable conditions, the runners will grow three or four feet per month. When asked how to get rid of pangola grass when once established, Florida ranchers replied without exception, "We want more of it, and have never thought of getting rid of it."

Use a Starter Solution

A practical and economical way to speed up growth of newly-set plants is to use a starter solution. Cabbage, cauliflower, broccoli, tomatoes, peppers and many other vegetable and flower transplant crops can be hastened along in this manner. Only a very little fertilizer is required but larger yields, better vigor and earlier maturity can be obtained. You need to follow a good garden fertilizer and soil-building program even tho a starter solution is used.

A starter solution may be prepared by dissolving one pound of a regular mixed commercial fertilizer, such as 4-12-4, 6-30-0, or a similar material, in 5 gallons of water. Phosphate fertilizer such as 20 per cent or 45 per cent material could be used at the same equivalent rate to good advantage. A little nitrogen in the mixture helps and I think is better than using phosphate alone. After the material is well stirred up, 1/2 pint to 1 pint of this mixture can be poured around each plant. You can repeat this treatment in a week or 10 days, if more rapid results seem needed. The solution can be used along the side of row crops. It should not come in contact with the foliage.

Do not expect all the fertilizer to dissolve since some may be a carrier that will not go into solution. In a late planting season, use of dissolved fertilizer materials certainly will make for earlier production. Plants will not stand around as long and bleach out for lack of quickly-available plant food that can be supplied by this solution method.

—Kansas Farmer

Cows Now Give Chilled Milk

A revolutionary milk cooler invented by Dairyman Elmer Lundvall of Greeley, Colorado, lowers the temperature of milk to 40 degrees within a few seconds after it leaves the cow. Called the "biggest step forward in the dairy industry for several years" by Dr. E. L. Nye, head of the department of bacteriology and pathology at Colorado A & M College, the new cooler is now being made available through various refrigerator companies.

Lundvall won a $200 second prize at the Colorado inventor's congress in 1947 for inventing the cooler. The dairyman inventor simply used his head in developing the new apparatus, which is an adaptation of the electric refrigerator principle. In other words, the new cooler has a brine-filled refrigerating coil which fits into the milking machine pail or into a 10-gallon shipping can. Milk, coming from the cow as she is milked, passes over the coil and is cooled immediately. This permits lowering the temperature of the milk to the desired range between 40 and 50 degrees without allowing it to come in contact with the air or other sources of bacterial contamination.

Advantages of the new cooling method, which operates on the same principle as the home refrigerator, include reduced cooling costs, decreased manual labor in milk handling and assurance of sanitary milk with a low bacteria count.

Milk comes from cows at their body temperature of 101.5 degrees. At this temperature, the number of bacteria in the milk doubles every 20 minutes. After the milk temperature has been lowered to around 40 degrees, the multiplication of bacteria is virtually halted. This is the reason that instant cooling of the milk is so advantageous.

The instant cooler can be used to advantage the year round. It is necessary to keep milk below 50 degrees overnight to prevent the bacteria count from going too high. If the cans are cooled to 40 degrees with this machine, they can be covered with canvas and will remain sufficiently cool throughout the night. If desired, the brine tank used in the refrigeration process can also be utilized as a holding tank for keeping the milk cold.

In practical tests on the farm, the new cooler demonstrated its many advantages to dairymen and dairy experts who were present. It has been estimated that the refrigerating system will lower the average farmer's cooling costs 50 percent.

—*Utah Farmer*

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Dairy Science—By W. E. Petersen, Asso. Prof. Dairy Husbandry, University of Minnesota. J. B. Lippincott. $5.00.

Animal Sanitation and Disease Control—By R. R. Dykstra, Dean, School of Veterinary Medicine, Kansas State College. The Interstate Printers & Publishers. $5.00.

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Hunger Signs in Crops—A symposium, edited by Gove Hambege. Again available. Published by the American Society of Agronomy and the National Fertilizer Association. $4.50.

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BEAUTY

"Beauty means this to one person, perhaps, and that to the other. And yet when any one of us has seen or heard or read that which to him is beautiful, he has known an emotion which is in every case the same in kind, if not in degree; an emotion precious and uplifting. A choir boy's voice, a ship in sail, an opening flower, a town at night, the song of the blackbird, a lovely poem, leaf shadows, a child's grace, the starry skies, a cathedral, apple trees in spring, a thoroughbred horse, sheepbells on a hill, a rippling stream, a butterfly, the crescent moon—the thousand sights or sounds or words that evoke in us the thought of beauty—these are the drops of rain that keep the human spirit from death by drought. They are a soothing and a silent refreshment that we perhaps do not think about but which goes on all the time. . . . It would surprise any of us if we realized how much store we unconsciously set by beauty, and how little savour there would be left in life if it were withdrawn. It is the smile on the earth's face, open to all, and needs but the eyes to see, the mood to understand."

From: Candelabra
—John Galsworthy

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